



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

### Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

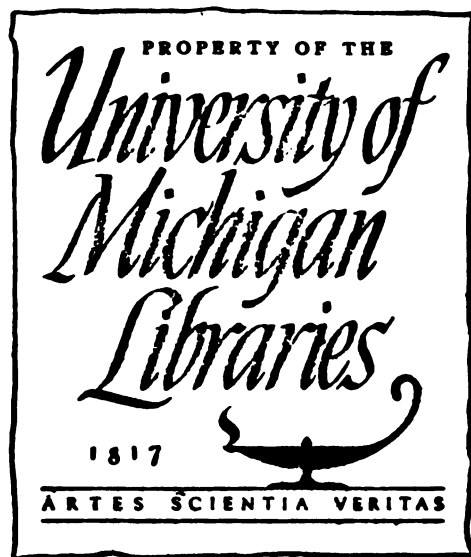
We also ask that you:

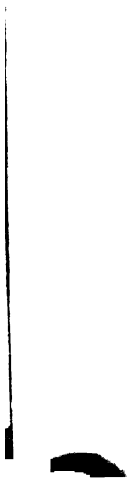
- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

### About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>

B 1,067,824









## ADVERTISEMENT.

The publications of the United States Geological Survey are issued in accordance with an act approved March 3, 1879, which declares that—

"The publications of the Geological Survey shall consist of the Annual Report, general and economic maps illustrating the resources and classifications of the country, and reports of the general and economic geology and paleontology. The annual report of the Survey shall accompany the annual report of the Secretary of the Interior, and reports of said Survey shall be issued in uniform quarto series if deemed proper, but otherwise in ordinary octavos. Three thousand copies of each shall be distributed free of charge to exchanges and for sale at the price of publication; and all literary and cartographic publications in exchange shall be the property of the United States and form a part of the Library of the Survey. And the money resulting from the sale of such publications shall be used for the purchase of books for the Library of the Survey of the United States."

### ANNUAL REPORTS.

From the above it will be seen that only the Annual Reports, which form part of the publications of the Secretary of the Interior and are printed as executive documents, are available for distribution. A number of these are furnished the Survey for its exchange list, but are supplied directly, through the document rooms of Congress, to members of the House and Senate. Except, therefore, in those cases in which an extra number is supplied to this office, application must be made to members of Congress for the Annual Reports, and for other executive documents.

Of these annuals there have been already published:

- I. First Annual Report to the Hon. Carl Schurz, by Clarence King, 80, Washington, 1880.—A preliminary report describing plan of organization and publications.
- II. Report of the Director of the United States Geological Survey for 1880-'81, by Clarence King, 1882, 1v, 588 pp., 61 plates, 1 map.

### CONTENTS.

- Report of the Director, pp. 1-1v, plates 1-7.  
Administrative Reports by Heads of Divisions, pp. 1-46, plates 8 and 9.  
The Physical Geology of the Grand Cañon District, by Capt. C. E. Dutton, pp. 47-106, plates 10-36.  
Contributions to the History of Lake Bonneville, by G. K. Gilbert, pp. 107-156.  
Abstract of Report on the Geology and Mining Industry of Leadville, Colorado, by W. H. Emmons, pp. 157-290, plates 44 and 45.  
A Summary of the Geology of the Comstock Lode and the Washoe District, by W. H. Emmons, pp. 291-330, plates 46 and 47.  
Production of Precious Metals in the United States, by Clarence King, pp. 331-382.  
A New Method of Measuring Heights by means of the Barometer, by G. K. Gilbert, pp. 383-412, plates 54-61.  
Index, pp. 567-588.

The Third Annual Report is now in press.

### MONOGRAPHS.

The Monographs of the Survey are printed for the Survey alone, and can be distributed through a fair exchange for books needed in its library, or through the sale of the above the number needed for such exchange. They are not for gratuitous distribution. So far as already determined upon, the list of these monographs is as follows:

- I. The Precious Metals, by Clarence King. In preparation.
- II. Tertiary History of the Grand Cañon District, with atlas, by Capt. C. E. Dutton.

- III. Geology of the Comstock Lode and Washoe District, with atlas, by George F. Becker. In press.  
 IV. Comstock Mining and Miners, by Eliot Lord. In press.  
 V. Copper Rocks of Lake Superior and their continuation through Minnesota, by Professor R. D. Irving. In press.  
 VI. Older Mesozoic Flora of Virginia, by Prof. Wm. M. Fontaine. In press.  
 Geology and Mining Industry of Leadville, with atlas, by S. F. Emmons. In preparation.  
 Geology of the Eureka Mining District, Nevada, with atlas, by Arnold Hague. In preparation.  
 Coal of the United States, by Prof. R. Pumpelly. In preparation.  
 Iron in the United States, by Prof. R. Pumpelly. In preparation.  
 Lesser Metals and General Mining Resources, by Prof. R. Pumpelly. In preparation.  
 Lake Bonneville, by G. K. Gilbert. In preparation.  
 Dinocerata. A monograph on an extinct order of Ungulates, by Prof. O. C. Marsh. In press.  
 Sauropoda, by Prof. O. C. Marsh. In preparation.  
 Stegosauria, by Prof. O. C. Marsh. In preparation.  
 Of these monographs, No. II is published, viz:  
 II. Tertiary History of the Grand Cañon District, with atlas, by C. E. Dutton, Capt. U. S. A., 1882, 4<sup>o</sup>, 264 pp., 42 plates, and atlas of 26 double sheets folio. Price \$10.12.  
 Nos. III, IV, V, and VI are in press and will appear in quick succession. The others, to which numbers are not assigned, are in preparation.

## BULLETINS.

In its Bulletins the Survey will print such papers relating to the general purpose of its work as do not properly come under the heads of ANNUAL REPORTS or MONOGRAPHS.

The Bulletins will each contain but one paper, and be complete in itself. They will, however, be numbered in a continuous series, and will in time be united into volumes of convenient size. To facilitate this each Bulletin will have two paginations, one proper to itself at the top, and at the bottom, one which belongs to it in the volume.

Of this series of Bulletins this paper forms No. 1, and is also the first part of Volume I.

Its price is ten cents.

Correspondence relating to the publications of the Survey, and all remittances, should be addressed to the

DIRECTOR OF THE UNITED STATES GEOLOGICAL SURVEY,

Washington, D. C.

WASHINGTON, D. C., February 24, 1883.

- III. Geology of the Comstock Lode and Washoe District, with atlas, by George F. Becker. 1  
 IV. Comstock Mining and Miners, by Elliot Lord. In press.  
 V. Copper Rocks of Lake Superior and their continuation through Minnesota, by Professor Irving. In press.  
 VI. Older Mesozoic Flora of Virginia, by Prof. Wm. M. Fontaine. In press.  
 Geology and Mining Industry of Leadville, with atlas, by S. F. Emmons. In preparation.  
 Geology of the Eureka Mining District, Nevada, with atlas, by Arnold Hague. In preparation.  
 Coal of the United States, by Prof. R. Pumpelly. In preparation.  
 Iron in the United States, by Prof. R. Pumpelly. In preparation.  
 Lesser Metals and General Mining Resources, by Prof. R. Pumpelly. In preparation.  
 Lake Bonneville, by G. K. Gilbert. In preparation.  
 Dinocerata. A monograph on an extinct order of Ungulates, by Prof. O. C. Marsh. In press.  
 Sauropoda, by Prof. O. C. Marsh. In preparation.  
 Stegosauria, by Prof. O. C. Marsh. In preparation.  
 Of these monographs, No. II is published, viz:  
 II. Tertiary History of the Grand Cañon District, with atlas, by C. E. Dutton, Capt. U. S. A., 264 pp., 42 plates, and atlas of 26 double sheets folio. Price \$10.12.  
 Nos. III, IV, V, and VI are in press and will appear in quick succession. The others, the numbers are not assigned, are in preparation.

## BULLETINS.

In its Bulletins the Survey will print such papers relating to the general purpose of its work not properly come under the heads of ANNUAL REPORTS or MONOGRAPHS.

The Bulletins will each contain but one paper, and be complete in itself. They will, however, be numbered in a continuous series, and will in time be united into volumes of convenient size. Each Bulletin will have two paginations, one proper to itself at the top, and at the bottom which belongs to it in the volume.

Of this series of Bulletins this paper forms No. 1, and is also the first part of Volume I.

Its price is ten cents.

Correspondence relating to the publications of the Survey, and all remittances, should be addressed to the

DIRECTOR OF THE UNITED STATES GEOLOGICAL SURVEY  
 Washington

WASHINGTON, D. C., February 24, 1883.

DEPARTMENT OF THE INTERIOR

---

BULLETIN

3-3600

OF THE

UNITED STATES

GEOLOGICAL SURVEY

THE UNIVERSITY OF MICHIGAN  
University Library  
Ann Arbor, Michigan

CAUTION --- Please handle this volume with  
care. The paper is very brittle.



WASHINGTON  
GOVERNMENT PRINTING OFFICE  
1883

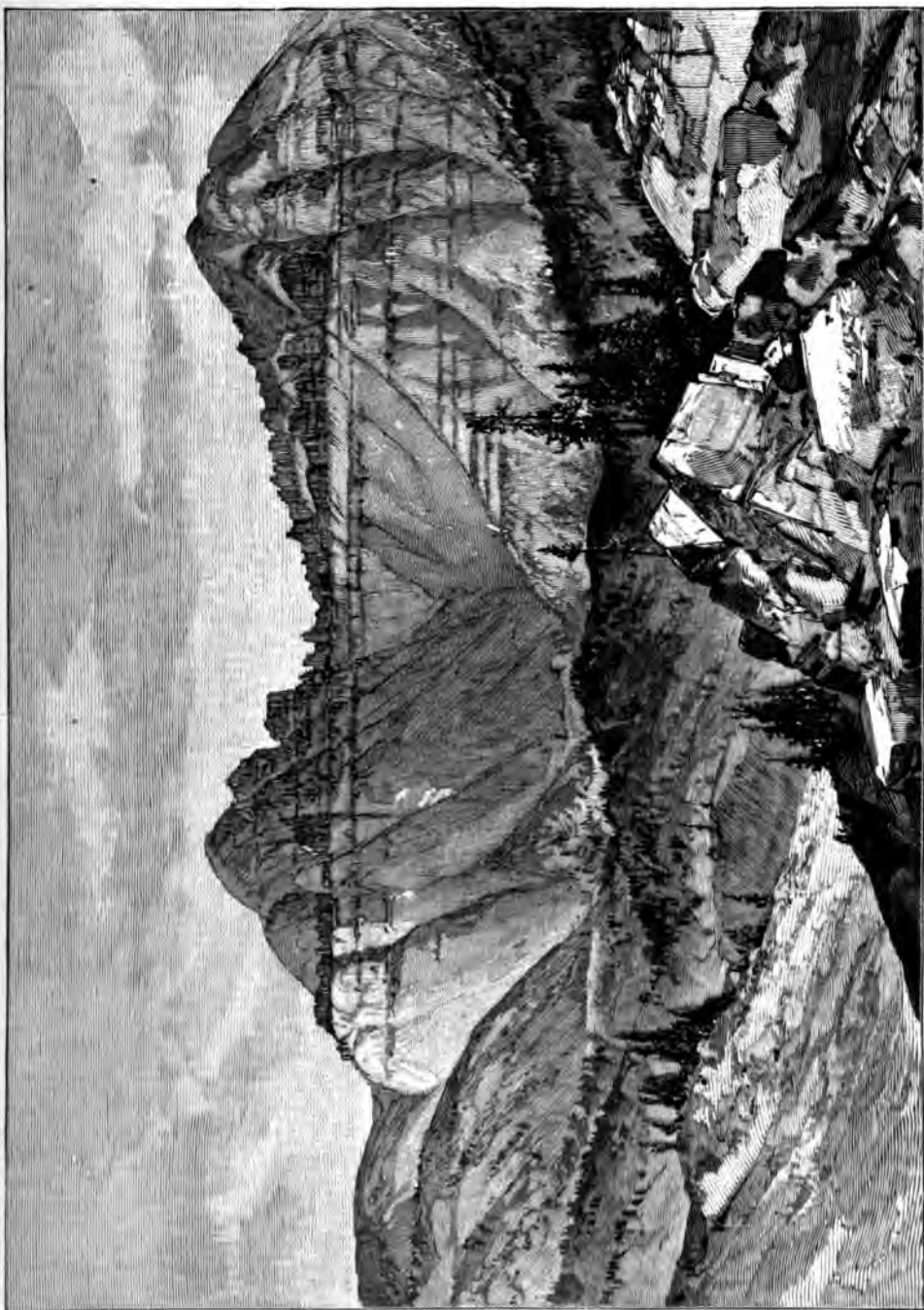












BUFFALO PEAKS—FROM THE NORTH.

## ADVERTISEMENT.

The publications of the United States Geological Survey are issued in accordance with the statute, approved March 3, 1879, which declares that—

"The publications of the Geological Survey shall consist of the Annual report of operations, geological and economic maps illustrating the resources and classifications of the lands, and reports upon general and economic geology and paleontology. The annual report of operations of the Geological Survey shall accompany the annual report of the Secretary of the Interior. All special memoirs and reports of said Survey shall be issued in uniform quarto series if deemed necessary by the Director, but otherwise in ordinary octavos. Three thousand copies of each shall be published for scientific exchanges and for sale at the price of publication; and all literary and cartographic materials received in exchange shall be the property of the United States and form a part of the library of the organization. And the money resulting from the sale of such publications shall be covered into the Treasury of the United States."

### ANNUAL REPORTS.

From the above it will be seen that only the Annual Reports, which form parts of the reports of the Secretary of the Interior and are printed as executive documents, are available for gratuitous distribution. A number of these are furnished the Survey for its exchange list, but the bulk of them are supplied directly, through the document rooms of Congress, to members of the Senate and House. Except, therefore, in those cases in which an extra number is supplied to this office by special resolution, application must be made to members of Congress for the Annual Reports, as for all other executive documents.

Of these annuals there have been already published:

- I. First Annual Report to the Hon. Carl Schurz, by Clarence King, 8°, Washington, 1880, 79 pp., 1 map.—A preliminary report describing plan of organization and publications.
- II. Report of the Director of the United States Geological Survey for 1880-'81, by J. W. Powell, 8°, Washington, 1882, lv, 588 pp., 61 plates, 1 map.

### CONTENTS.

- Report of the Director, pp. i-iv, plates 1-7.  
Administrative Reports by Heads of Divisions, pp. 1-46, plates 8 and 9.  
The Physical Geology of the Grand Cañon District, by Capt. C. E. Dutton, pp. 47-166, plates 10-36.  
Contributions to the History of Lake Bonneville, by G. K. Gilbert, pp. 167-200, plates 37-43.  
Abstract of Report on the Geology and Mining Industry of Leadville, Colorado, by S. F. Emmons, pp. 201-290, plates 44 and 45.  
A Summary of the Geology of the Comstock Lode and the Washoe District, by George F. Becker, pp. 291-330, plates 46 and 47.  
Production of Precious Metals in the United States, by Clarence King, pp. 331-401, plates 48-53.  
A New Method of Measuring Heights by means of the Barometer, by G. K. Gilbert, pp. 403-565, plates 54-61.  
Index, pp. 567-588.

The Third Annual Report is now in press.

### MONOGRAPHS.

The Monographs of the Survey are printed for the Survey alone, and can be distributed by it only through a fair exchange for books needed in its library, or through the sale of those copies over and above the number needed for such exchange. They are not for gratuitous distribution.

So far as already determined upon, the list of these monographs is as follows:

- I. The Precious Metals, by Clarence King. In preparation.
- II. Tertiary History of the Grand Cañon District, with atlas, by Capt. C. E. Dutton. Published.

QE  
75  
.B8

## LETTER OF TRANSMITTAL.

---

UNITED STATES GEOLOGICAL SURVEY,  
DIVISION OF THE ROCKY MOUNTAINS,  
*Denver, Colo., October 1, 1882.*

SIR: I have the honor to transmit herewith a paper by Mr. Whitman Cross on Hypersthene-Andesite, with a brief sketch by myself of the geology of Buffalo Peaks.

The material from which it has been prepared was obtained during the geological study of the Leadville region, and would naturally have been included in the monograph on that district but for the following reason: The andesites from Buffalo Peaks, which, at first glance, appeared to be most characteristic augite-andesites, were found by Mr. Cross on careful examination to differ essentially from the normal order as commonly described. In tracing out the relations of these rocks to the closely-allied so-called augite-andesites, Mr. Cross has obtained results which, if substantiated, give to these investigations a much more general than local character, and make them of value to lithologists in general; so that it seems desirable that they should be published by themselves in the form of a special paper.

Very respectfully, your obedient servant,

S. F. EMMONS,  
*Geologist in Charge.*

Hon. J. W. POWELL,  
*Director United States Geological Survey.*



---

•

•

•

•

•

•

ERRORS IN BULLETIN 1, UNITED STATES GEOLOGICAL SURVEY.

TEXT.

Page 15, line 4 from below, omit "already."  
Page 28, line 4 from below, for "III and III" read *I, II, and III*.  
Page 33, lines 8, 28, and 34, for "Niedzwiedski" read *Niedzwiedski*.  
Page 33, lines 30 and 31, for "von Drasche" read *Niedzwiedski*.  
Page 37, line 12 from below, for "Bendant" read *Boudant*.  
Page 37, line 6 from below, for "Jahrbuck" read *Jahrbuch*.

INDEX.

Page 39, line 10, insert *Augitic rocks* before "Triclinic pyroxene in."  
Page 39, line 11, for "Audrian" read *Andrian*.  
Page 39, line 13, for "Bendant" read *Boudant*.  
Page 39, line 15, for "Dana, J. D.," read *Damour*.  
Page 39, line 17, omit "34."  
Page 39, line 20, omit "on."  
Page 39, line 25, for "Niedzwiedski" read *Niedzwiedski*.  
Page 39, line 27, for "Von" read *com*.  
Page 39, line 31, for "Tables compiled by" read *Analyses by*.  
Page 39, line 34, for "Rhombic pyroxene" read *Augite*.  
Page 39, line 40, for "Bendant" read *Boudant*.  
Page 39, line 42, for "Delarue" read *Dalarns*.  
Page 39, line 46, for "Borac" read *Borač*.  
Page 40, line 14, for "35" read 34.  
Page 40, line 17, for "Dana, J. D.," read *Damour*.  
Page 40, line 21, omit "34."  
Page 40, line 28, for "andisite" read *andesite*.  
Page 40, line 32, omit comma after Gorni.  
Page 40, line 36, for "Hillerbrand" read *Hillebrand*.  
Page 40, line 38, omit entire line.  
Page 41, line 7, for "Moscar" read *Moscar*.  
Page 41, line 14, for "Niedzwiedskie" read *Niedzwiedski*.  
Page 41, line 26, for "Von" read *com*.  
Page 41, line 46, for "Tables compiled by" read *Analyses by*.

NOTE.—In explanation of the great number of errors in this bulletin, it is due the authors to state that the index was called for at very short notice and somewhat hurriedly prepared, with the expectation of careful revision in the proof, but that, mistake, no proof of the same was submitted to them.

[illegible]

## CONTENTS.

|                                                                                              | Page. |
|----------------------------------------------------------------------------------------------|-------|
| LETTER OF TRANSMITTAL .....                                                                  | 7     |
| INTRODUCTORY GEOLOGICAL SKETCH OF BUFFALO PEAKS, BY S. F. EMMONS....                         | 11    |
| ON HYPERSTHENE-ANDESITE AND ON TRICLINIC PYROXENE IN AUGITIC ROCKS,<br>BY WHITMAN CROSS..... | 19    |
| CHAPTER I.—Hypersthene-andesite from Buffalo Peaks, Colorado.....                            | 19    |
| Description of rock .....                                                                    | 19    |
| Triclinic pyroxene in other rocks .....                                                      | 23    |
| Chemical composition of the rock.....                                                        | 25    |
| Isolation and analysis of hypersthene.....                                                   | 26    |
| CHAPTER II.—Rhombic pyroxene in other andesites .....                                        | 31    |
| Previous observations of rhombic pyroxene in augite-andesites.....                           | 33    |
| Rhombic pyroxene in diabasic rocks.....                                                      | 35    |
| Rhombic pyroxene in hornblende-andesite .....                                                | 36    |
| Classification of andesitic rocks.....                                                       | 36    |
| Results .....                                                                                | 38    |

## ILLUSTRATIONS.

|                                             |    |
|---------------------------------------------|----|
| PLATE I.—Buffalo Peaks, Mosquito Range..... | 5  |
| PLATE II.—Micro-sections of crystals.....   | 39 |

(9-10)



## INTRODUCTORY GEOLOGICAL SKETCH OF BUFFALO PEAKS, MOSQUITO RANGE, COLORADO.

---

BY S. F. EMMONS.

---

During the summer of 1880, a little over two months' field-work was devoted by the party under my charge to a geological study of a portion of the Mosquito or Park Range, as an essential preparation for the investigation of the remarkable ore deposits of the Leadville region.

The area covered by the geological map prepared at this time, which included a length of about 20 miles along the crest, comprised not only its most elevated portion, but also, with a single exception, the most interesting part of the range from a geological stand-point. This exception was found in the Buffalo Peaks, a double-pointed mountain mass rising about 1,000 or 1,500 feet above the main crest, some 10 miles south of Weston's Pass, at the southern limits of our map. Two days were devoted to a hasty examination of these interesting peaks; but, although as many weeks might have profitably been employed in their study, for the reason that the geological phenomena here exhibited had no apparent connection with the ore deposits at Leadville, it was not considered advisable at the time to devote any more of the brief working season of this elevated region to an extraneous study, however interesting. Inasmuch, however, as the microscopical investigations of the specimens collected at that time, made by Assistant Geologist Mr. Whitman Cross, have led to the discovery of hitherto unrecognized characteristics in an important group of Tertiary volcanic rocks, which is set forth in the following pages, it may not be inappropriate to preface his paper with a brief geological sketch of the structure of these peaks, and of their relation to the rest of the range.

The Mosquito Range north of Weston's Pass is made up of Palæozoic beds about 4,500 feet in thickness, extending from the Cambrian to the Upper Carboniferous, with intercalated sheets or intrusive masses of various quartz porphyries and porphyrites, resting on Archæan granite and gneiss. The elevation of the range, which took place at the close of the Cretaceous period, was accompanied by the compression of these beds into a series of sharp folds, characterized by a steep side to the west, or towards the Archæan island, round which the sediments were originally deposited, and by numerous longitudinal faults, with

an upthrow to the east, more or less parallel to the axes of the folds, with which, in general, they are intimately connected.

Towards the south this structure becomes gradually simplified, and the porphyry bodies thin out. At Weston's Pass, already, in place of the complicated system of faults and folds observed in the latitude of Leadville, two great anticlinal and synclinal folds are found, whose axes have the direction of N. 30° W., and whose eastern member has been raised by displacement along a fault plane having about the same direction. One of these folds occupies the main crest of the range, and its corresponding fault runs along the trough of the synclinal on the west, by whose movement the Archæan granite is raised on the crest of the range about 2,000 feet above its corresponding position under the Palæozoic beds which form the surface at the pass itself. The thickness of the interbedded porphyry sheet, which opposite Leadville reaches over 1,000 feet, has here diminished to a little over 20 feet.

The other fold forms a secondary elevation, called Sheep Ridge, on the foot-hills, five miles east of the crest. Here the fault line corresponds very nearly with the axis of the anticlinal fold, which is also that of the ridge, the movement of displacement gradually decreasing in a southerly direction, until the fault ridge becomes simply the elevation of an anticlinal fold. About five miles farther south, at the junction of the Little Platte, which from Weston's Pass flows southeast along the trough of the synclinal, and of Rough-and-Tumbling Creek, which drains the north slope of Buffalo Peaks, not only have the two great faults disappeared, but the two systems of anticlinal folds are merged into a single monoclinical.

Topography is here in singular sympathy with geological structure. Both the main crest and the secondary ridge to the east have the same general direction, with the strike of the geological formations, while the average direction of the topographical crest of the range, as a whole, is more nearly north and south, and its structure consequently that of a series of ridges *en échelon*. Sheep Ridge on the east disappears completely under the plain before the valley of the Little Platte is reached, and is succeeded by an isolated butte called Black Hill, formed by a massive outburst of crystalline rhyolite, breaking through and spreading out over the upturned edges of the Upper Coal Measure formation. The main ridge, which forms the eastern wall of Weston's Pass, descends rapidly to the south, reaching the level of the valley as the Little Platte bends east to flow out into the plains of the South Park, just above its junction with Rough-and-Tumbling Creek. Between these two creeks and near their junction is a series of low ridges formed by strata standing at a great variety of angles and with varying directions of strike, which show the effect of the merging of the double system of folds to the north into the simple monoclinical structure which prevails to the south.

The topographical divide of the range therefore leaves the main crest

at Weston's Pass, and crosses to a second ridge, which overlaps it, on the west of the pass. Stretching southeastward in the direction of the strike, it continues with apparent regularity as far as the Trout Creek Pass, about 20 miles distant along the crest of the range. The structure of this portion of the range, as determined in our hasty visit, seems quite simple. On the west, towards the Arkansas Valley, it presents steep precipitous slopes of Archæan granite. The crest of the higher portion of the ridge is covered by a thin shell of easterly-dipping Cambrian quartzite whose average thickness in this region is about 150 to 200 feet. Resting conformably on this is the White or Silurian Limestone, of about equal thickness, succeeded by the Lower Carboniferous or Blue Limestone, also about 200 feet in thickness; then 2,000 to 2,500 feet of silicious beds, which have been designated the Weber grits; and along the extreme eastern flanks of the range the Upper Coal Measure beds, which consist partly of limestone and partly of coarse reddish sandstone. In the plains along the eastern foot of the range are found occasional ridges of the red sandstones and shales of the Trias, from which it is probable that the salt of the salt springs east of Buffalo Peaks has been derived.

Midway in this monoclinal ridge, and resting on the upturned edges of the strata, are the horizontal beds of andesitic lavas which form the Buffalo Peaks. Their western base rests on granite, immediately under the quartzite, while their eastern flows, whose limits were not ascertained, probably extend well out over the Upper Coal Measure formation. The direction of strike of the sedimentary beds, on the north side at least, seems to have been but little affected by this extrusion of volcanic material; but in immediate contact with the lava, as will be shown later, they have been considerably metamorphosed.

The Buffalo Peaks form an extremely picturesque mountain mass, whose highest point rises to an elevation of 13,541 feet above sea-level, or about 4,000 feet above the adjacent valleys. It consists of a narrow curving ridge forming about one-third of a circle, its concave side toward the north, with a culminating point at either extremity of the arc, the connecting saddle being about 500 feet below their summits. From the northeast base of the eastern peak spreads a broad, flat, massive shoulder, whose area is considerably greater than that of the main peaks. Between the two peaks lies a semi-circular amphitheatre about 2,000 feet deep, in which the appropriately named Rough-and-Tumbling Creek takes its rise, and flows first northward, then eastward to its junction with the Little Platte. The upper 500 feet of the two main peaks is formed of hornblende-andesite of decidedly trachytic habit. Its matrix is of a brownish-gray color, with small crystals of white feldspar and frequent needles of black hornblende. In its columnar structure is very well developed, especially on the connecting ridge between the two peaks, where the columns are often only a few inches in diameter. At this point, rounded fragments of Archæan rocks included in the ande-



site are of frequent occurrence. There is also a very considerable development of hyalite on the weathered surface of the rocks, and fulgurite is found at the summit of the higher or western peak, lining small holes made by the electric fluid.

The base of the hornblende-andesite is extremely well defined, as shown in the frontispiece, by a horizontal line at about the level of the saddle connecting the two main peaks. Below this, as well as could be seen on the walls of the amphitheatre where they were sufficiently steep not to be obscured by *débris*, the mass of the mountain seems to be made up of tufas and of half-glassy modifications, which are also horizontally bedded, conformable with the base line of the hornblende-andesite. A section was made down the steep spur extending from the north base of the eastern peak into the amphitheatre, giving a freely estimated thickness of 1,000 to 1,500 feet of these tufaceous varieties.

#### SECTION.

1. 200-500 feet.—Hornblende-andesite.
2. 50 feet.—Semi-vitreous tufa of bright red color, with streaks of black and reddish glass running through it, and containing crystals of basic minerals and of feldspar, with innumerable small inclosed fragments of lavas and other rocks not always determinable.
3. 100 feet.—Beds of similar material, rather black in color. Among inclosed fragments rounded masses of granite, up to 6 feet in diameter, are frequent. Through the mass are thin seams or beds of black glass of a perlitic structure, like an obsidian, with plentiful small fragments of feldspar scattered through the mass.
4. 100 feet.—White and lilac colored porous tufa, with fragments of light-colored trachytic rock, rich in smoky quartz (dacite or rhyolite?).
5. 200 feet.—Tufaceous breccia, with boulders of black, vitreous-looking hypersthene-andesite.
6. 5 feet.—Bed of *dacite* (rhyolite?).\*
7. 50 feet.—Light-colored tufa with fragments of *dacite* (rhyolite?).
8. 500-700 feet.—Space somewhat covered, mostly of tufa, inclosing fragments of a great variety of rocks.

The next outcrop below the base of the spur was found to be limestone and shales, probably belonging to the Weber grits formation, dipping to the northeast at an angle of about 45°, and having the regular strike of the sedimentary rocks of the region. Within these tufa beds, and weathered out on their surface, were found an immense number of

\*The rock described here as *dacite* (rhyolite?) is one which, from the specimens at hand, it has been impossible to assign definitely to either of these two classes. Macroscopically it resembles the rhyolites, having large smoky quartz and glassy-looking feldspars in a lilac-colored matrix, and possessing a very decided trachytic habit. Microscopical examination fails to determine definitely whether the one specimen in the collection contains more orthoclase or plagioclase feldspar. A partial chemical analysis is equally unsatisfactory, giving silica, 66.500; potash, 2.567; soda, 3.868. It is identical with a rock found breaking through the granite, near the town of Granite, in the Arkansas Valley, west of the Buffalo Peaks. A further field examination will be required to satisfactorily determine the character and relations of this rock.

more or less rounded fragments of included rocks, consisting mainly of granite and various lavas; the latter of which, as far as examined by Mr. Cross, have proved to be of the same character as the northeastern shoulder, i. e., hypersthene-andesite.

The rock of the eastern shoulder, as far as examined, is a dark, nearly black, compact, semi-vitreous rock of conchoidal fracture, which in the field was determined at once as an augite-andesite. The average level of this eastern spur is some 700 or 800 feet lower than that of the summit of the peaks. As far as our observation extended, this rock was not found in mass in direct connection with the hornblende-andesite.

At the northeast base of the eastern peak, about midway between well-defined outcrops of the two rocks, a German miner had sunk a shaft on the flat surface of the ridge, in an iron-stained, clayey material, undoubtedly the result of decomposition of the lava, in which he found very large, irregular masses of milk-white, common opal. Some of these masses reached several feet in diameter, and when broken open it was generally found that their centre consisted of opaque, flint-like chalcedony; showing that in this case the opal had probably resulted from the hydration of chalcedony concretions within the mass of the rock. It was also observed that while the internal kernel of flint readily gave sparks when struck with steel, the exterior opaline portion was not of sufficient hardness to do this. A chemical examination was made of the flint-like kernel and of the white opaline alteration product, with the following result:

|                                          | Flint.  | Opal.   |
|------------------------------------------|---------|---------|
| Specific gravity .....                   | 2.570   | 2.023   |
| Hardness .....                           | 6.      | 5.5     |
| Loss by ignition (water).....            | 1.843   | 2.584   |
| Insoluble (in caustic potash) silica.... | 32.430  | 0.710   |
| Soluble silica .....                     | 65.727  | 96.706  |
|                                          | 100.000 | 100.000 |

From which it would seem that the change to the opaline form is not simply the result of hydration, since the increase in water in the latter case is only 0.741, or a little over a third more than in the original form of the secretion, but that this must have been accompanied by some molecular change, by which the percentage of soluble silica has become nearly one-half greater.

The outcrops of the upturned sedimentary beds could be traced up to the very entrance of the amphitheatre; the Weber shales, as already mentioned, had been already observed at the base of the eastern peak; the Lower Quartzites resting on the granite form the main crest of the range immediately north of the western peak, while at the northeast base of this peak, at the entrance to the amphitheatre, there was

a cropping of white and blue silicified limestone, showing in a very interesting manner a relic of the solfataric action which probably succeeded the eruption of the lavas. Here the bedding is distinctly seen; the color of the limestone, its granular structure and characteristic veining are still preserved; but the whole mass is completely transformed into silica, and the surfaces frequently coated with a thin white opaline deposit. Chemical tests of three specimens brought from these outcrops, one white or drab, the other two blue limestone, showed the following contents in silica:

|                        | Per cent. |
|------------------------|-----------|
| White limestone .....  | 97.1      |
| Bluish limestone ..... | 97.7      |
| Darker limestone ..... | 78.9      |

with an<sup>a</sup> apparently more than normal proportion of manganese, especially in the darker colored specimen.

The southern slopes of the peak were not examined, but from the summit outcrops of the upturned sedimentary beds could be seen continuing on southward beyond the base of the peak, apparently in a direct line with those observed on the north. The very centre of the amphitheatre was also not visited, as the soft slopes resulting from the decomposition of the tufa beds promised but few outcrops.

Two important questions present themselves in the consideration of the structure of this interesting mass; neither of which, unfortunately, can be considered as definitely decided by the hasty observations made during this visit:

First. Are the peaks the relics of an old volcanic crater?

Second. Was the hornblende- or the hypersthene-andesite the earlier flow?

To the first question the circular form of the main ridge, and its bedded structure, seem at first glance to give a decidedly favorable answer. More mature consideration shows that the present form was mainly due to glacial and post-glacial erosion, whose work in this region has been on such a stupendous scale that evidently the present form of the peaks affords little guide as to the original condition of the mass. Had the present semi-circular ridge once formed part of the crater, we should expect to find some relic of the rest of the circle resting on the ridges to the north; but with the exception of the northeast shoulder, which consists of a distinct rock, and which is evidently also the result of a distinct flow, no lavas were found north of the entrance to the amphitheatre.

As regards the relative ages of the two varieties of andesite, it is to be observed, first, that the hornblende-andesite is the higher of the bedded series; and, second, that from the tufaceous beds no fragments of the hornblende-andesite were obtained; while those of hypersthene-andesite were of very frequent occurrence. On the other hand, the flat eastern shoulder, which is probably formed of hypersthene-andesite, re-

sembles in its form the lateral flows which come from the side of already built-up volcanoes; and as a general rule the more basic augite-andesites have been found to be younger than the hornblendic varieties. In the case of lavas, superposition is by no means necessarily a proof of later origin, inasmuch as the later flows often force themselves under those already existing. Still, in the present case, it must be acknowledged that the evidence, as far as obtained, is in favor of the earlier origin of the hypersthene-andesite.

A third point of interest for future investigation is the determination of the true character and relations of the dacite (rhyolite?) rocks.

The fact that in the present stage of microscopical lithology the old test of the absence of striation lines visible under the microscope is no longer sufficiently conclusive to determine a feldspar as orthoclasic, renders of doubtful value the earlier classification of many rocks as trachytic or andesitic. Many facts already observed by us suggest a doubt whether von Richthofen's classification of volcanic rocks will be found to hold good everywhere in Colorado, and even that many modifications of the relations of the older eruptive rocks, as well as of those of Tertiary age, may be found necessary. The field of work is great, and will involve long and laborious studies before definitive results can be obtained. In the western portion of the Cordilleran system Tertiary volcanic rocks and recent lavas are in vast preponderance, and the older eruptives have been found thus far in but few points. In Colorado, however, while the development of Tertiary eruptive rocks is considerable, it seems probable that a very large proportion of the eruptive rocks will prove to belong to those generally classed as older, from their lithological characteristics alone; of these, however, the most widely developed class may doubtless prove to be Post-Cretaceous, and of those which belong lithologically to the class of Tertiary eruptives or volcanics, there are many whose period of eruption can be but little later than this period.

(17)



# ON HYPERSTHENE-ANDESITE AND ON TRICLINIC PYROXENE IN AUGITIC ROCKS.

---

BY WHITMAN CROSS.

---

## CHAPTER I.

### HYPERSTHENE-ANDESITE FROM BUFFALO PEAKS, COLORADO.

The microscopical and chemical investigation of certain andesites from the Buffalo Peaks in the Mosquito Range, Colorado, having proved conclusively that a rhombic pyroxene is, after plagioclase, the most essential constituent, the writer was led to examine carefully all similar rocks at his command. As the results attained are wide-reaching, and affect many well-known European rocks, the observations made on the Buffalo Peaks rock will be given in detail in Chapter I; the results of the comparative study are embodied in Chapter II.

The "Introductory Geological Sketch" by Mr. S. F. Emmons renders any further description of the Buffalo Peaks unnecessary; all reference to topographical or structural detail will be found sufficiently explained in that sketch.

### DESCRIPTION OF ROCK.

Those rocks which are to be specially considered in the following pages occur principally as included fragments in the tufa beds, and were found in place only on the shoulder of the main peak which projects to the northeast.

This latter rock is compact, dark or almost black in color, showing minute glassy feldspars, which, by reason of their transparency, seem dark also. A careful examination shows a number of small, dark-green grains and prisms, which are undoubtedly pyroxene, and glistening ore particles. In the fresh state the base in which these minerals lie has a vitreous lustre.

The fragments found in the tufa vary in outward appearance. Part of them are as dark and compact as the one just described, while others are lighter colored, with more distinct crystals of feldspar and a some-

what porous groundmass. In the darker ones, the feldspars are in part of a clear yellowish tinge, producing a very deceptive resemblance to the partially decomposed olivine of basaltic rocks.

When examined under the microscope in ordinary light, these rocks seem to be typical augite-andesites of very simple composition; clear plagioclase crystals, pyroxene in small crystals and irregular grains, with magnetite and apatite, are the only mineral constituents to be recognized. These larger individuals lie in a groundmass composed of thin plates of plagioclase, light-green microlites of pyroxene, and minute octahedrons of magnetite, with a glass basis between them, which is usually clear, though sometimes devitrified by light-brownish globulites. In the rock occurring in place, the microlites are unusually large, while in the others they sink to extraordinarily minute needles.

**PECULIARITIES OF THE PYROXENE.**—Examined in polarized light, none of the elements, except the pyroxene, show noteworthy peculiarities. A study of the pyroxenic constituent forces one to the conclusion that *a rhombic mineral, probably hypersthene, is largely predominant, while a great number, if not all of the remaining individuals, must be considered as triclinic in crystallization.*

This conclusion is based on the following microscopical and chemical investigations:

In the first place, on testing under the microscope, in polarized light, all the prismatic sections and small prisms whose vertical axis seemed to lie in the plane of the thin section, with regard to their optical orientation, it was found that at least one-half, and generally a much larger proportion, possessed an axis of elasticity parallel to the vertical crystallographic axis. Now, the only section of a monoclinic mineral, in the prismatic zone, which could act in this manner, is plainly that parallel to the orthopinacoid. And any one who has tested the prismatic sections of augite or hornblende, in slides of massive rocks, knows how rarely a section can be found so nearly parallel to the orthopinacoid that no deviation of the direction of total extinction from the vertical crystallographic axis can be detected. The justifiable conclusion is therefore reached, that nearly all of the sections in question belong to a rhombic mineral.

In the next place, the sections apparently cut perpendicularly to the vertical axis present another remarkable deviation from the rule. While such sections should give no data for the separation of rhombic from monoclinic pyroxene, since in both the directions of extinction coincide with the diagonals of the prism, it is here found that in only a portion of the sections does this relation actually exist, and, further, the numerical ratio between those cross-sections with normal and those with abnormal optical relations is, in any given slide, nearly equal to the ratio between those prismatic sections showing the rhombic and those with deviating optical orientation. It is at once suggested that the cross-sections showing normal optical action belong to the same

mineral which, in longitudinal sections, appears as rhombic, while the prismatic sections, which are seemingly normal augite, belong to the apparently triclinic mineral.

The rhombic mineral as shown by the chemical investigations (p. 29) must be considered as hypersthene. Its pleochroism, though distinct, is by no means strong. A section nearly or quite at right angles to the prism has a light-greenish-yellow color, and the changes on revolving it through  $90^\circ$  are too slight to be expressed. In prismatic sections the hypersthene is pale-green in color when its vertical axis is perpendicular to the principal section of the nicol, and greenish-yellow when these directions are parallel. In the latter position there is sometimes a tinge of brown. The other pyroxene is not pleochroic to any noticeable degree. It is always of a pale-green color.

The cross-sections of hypersthene are very well defined. They show the characteristic eight-sided figures of pyroxene, with a distinct prismatic cleavage, and, quite subordinate in some of the sections, a cleavage parallel to the pinacoids. In most of the sections showing a rhombic character, the pinacoidal faces are predominant, the prism simply truncating the angles of the rectangle formed by the former faces.

The hypersthene does not show the prismatic cleavage in longitudinal sections so plainly as the triclinic mineral. The lines are finer, and cross-fissures are common. The terminations, too, are often quite regular, being doubtless caused by domes. (See Fig. 9, Plate II.) It is in the small crystals especially that the regular form of a rhombic mineral is most plain. In the dark and compact rocks there is less difference between these two minerals than in the lighter and porous ones. In the latter one finds some crystals of hypersthene, which are fibrous, with an incipient decomposition proceeding from the cross-fissures along the vertical cleavage planes. (See Fig. 8, Plate II.)

**TRICLINIC PYROXENE.**—Those cross-sections, showing an anomalous position of the axes of elasticity, are in many ways remarkable. The outlines are similar to those of monoclinic augite, being eight-sided figures, with a distinct cleavage parallel to what may be taken as the prism. The deviation of the angle of extinction from the normal one for monoclinic minerals is *not* constant. Very many of the crystals are apparent twins, and the twinning plane bisects the prism angle in all observed cases.

For convenience, it will be assumed that this plane is the macropinacoid, in accordance with the common law of augite. The divergence of the direction of total extinction from this assumed macrodiagonal is in most cases  $20^\circ$  to  $25^\circ$ , but cases are not rare of its exceeding this average up to  $38^\circ 30'$  as observed maximum. It is more often above  $25^\circ$  than below  $20^\circ$ . It is not uncommon to find several angles of extinction indifferent portions of the same cross-section. This will be best understood by a reference to the figures of Plate II.

*Plate II.*—Fig. 1 represents a section with partially regular outline,



and a cleavage most pronounced in two directions, cutting each other at an angle of nearly  $90^\circ$ . In ordinary light it seems like a simple section of pale augite. In polarized light it appears at first to be a trilling whose composition face is  $\infty P \infty$ . On determining the direction of total extinction, the (in figure) upper and lower portions are found to agree with an angle of  $27^\circ 30'$  from the assumed macrodiagonal. The central portion, however, has an angle of extinction of  $10^\circ 30'$ , cutting the macrodiagonal in corresponding direction with the preceding. Its relations to the other portions are, therefore, not those of a plate in true twinning position. Moreover, within the central portion, is a small irregular patch, with cleavage parallel to that of the rest, having a third angle of extinction, viz,  $6^\circ 30'$ , and also in the same general direction.

The phenomenon is hence to be regarded as an intergrowth of substances with common crystallographic, but differing optical orientation. The central portion shows brilliant colors of polarization in certain positions, while the other parts vary only in degrees of light and shade.

In Fig. 2, the extinction of several parts is, as indicated, with angles of  $19^\circ 30'$  and  $37^\circ$ . In this case, however, the parts are related as in a trilling crystal, the direction of extinction of the central portion cutting the macrodiagonal in the manner necessary had there been a revolution of  $180^\circ$  about the normal to the macropinacoid. The parts with extinction of  $19^\circ 30'$  polarize somewhat more intensely than the others.

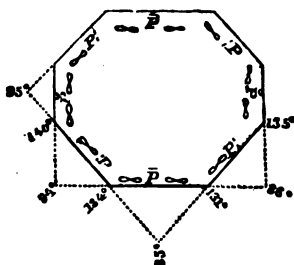
Fig. 3 shows a crystal  $0.16\text{mm}$  in diameter, with twin structure, the angles of extinction being respectively  $24^\circ$  and  $29^\circ$  for the two halves. The former gives more brilliant colors in polarized light.

Many small sections are very similar to Fig. 4, with about the same angle of extinction. Fig. 6 represents an apparent intergrowth of rhombic and triclinic pyroxene. The rhombic character is not demonstrable of course, but it seems most probable, as the intergrowth of hypersthene and other pyroxene in prismatic sections is often visible. (See Fig. 5.) The hypersthene polarizes brightly, while the other mineral neither gives distinct colors nor becomes very dark in any position between crossed nicols, so that its nature cannot be determined.

Although measurements of crystal angles made on chance sections in a slide of a fine-grained rock cannot, from the nature of the case, be accurate, an attempt was made to determine approximately the chief angles of the prismatic zone of this questionable mineral. As far as could be judged the section of Fig. 1 was cut very nearly at right angles to the vertical axis, and its bounding planes were sharply defined. The angle  $b$  of upper right-hand quadrant was first determined. The mean of several measurements, taken in different ways, was almost exactly  $140^\circ$ . To obtain the angle  $a$ , a measurement from  $\infty P \infty$  to the plane of intergrowth was made, as  $\infty P \infty$  was not well defined;  $131^\circ$  was the result within a few minutes. The angle of the two pinacoids was next measured at  $94^\circ$ , which would be necessary for the two pre-

ceding determinations. The angle  $a$  was determined as a mean of several trials at  $134^{\circ} 47'$ , the prism angle between faces on right-hand of section =  $95^{\circ}$  (nearly).

A section of the prism of this mineral, at right-angles to the vertical axis, would therefore have the accompanying form :



The figures of the plate will be seen to have a very similar form. If the sections Figs. 2 and 3 were of normal twins, according to a pinacoid face, there should be a re-entering angle visible, in case the above measurements are correct. On some of the sections seen, this seemed to be actually the case, but they were too small and indistinct to admit of measurement.

In some of the cross-sections the cleavage is apparently better developed parallel to one of the prismatic directions than to the other; for example, see Fig. 1; but this difference is very slight, and no weight can be laid on it.

#### TRICLINIC PYROXENE IN OTHER ROCKS.

The writer has noticed, and briefly described, an apparent triclinic pyroxene in certain crystalline schists in Brittany.<sup>1</sup> The phenomenon was there less distinct than in the present case, and it was then thought probable that it was an anomalous optical action of the monoclinic augite, the cause of which was unknown. No twin structure or intergrowth was there noticed, and the divergence of the direction of extinction from the normal one was even more variable than in the case in hand. The material, too, was less favorable for accurate observation, yet the two instances are so similar that in all probability they are due to the same cause.

A third occurrence of this same phenomenon has been observed by the writer in a feldspar basalt from Grand River, above the Hot Springs, Middle Park, Colorado. Mr. S. F. Emmons, in passing through the Park, collected specimens of several basalts, and one of them shows, under the microscope, a pyroxene seeming in ordinary light typical of the normal augite of such rocks. It is not pleochroic to any describable degree. Its cross-sections are eight-sided figures, with a strongly marked cleavage. Fig. 7, Plate II, represents a cross-section of a twin

<sup>1</sup>W. Cross: "Studien über bretonische Gesteine." Min. und pet. Mittheilungen. G. Tschermak, (Neue Folge), III, p. 396.

crystal observed in this basalt. The angles of extinction for the two halves,  $19^{\circ}$  and  $22^{\circ}$  from twinning plane, are perhaps within the limits of possible error of observation in a section whose exact position cannot be determined. All other cross-sections show similar relations, but the angle of extinction varies from  $18^{\circ}$  to  $33^{\circ}$  from a diagonal of the prism. In longitudinal sections the action is normal.

The finding of pyroxene with such abnormal optical properties in three distinct rocks, from such widely separated localities, led naturally to the examination of the pyroxene in the common augite rocks, such as diabase, basalt, &c. The result of such examination is to show that even in well-known rocks a portion of the pyroxene does not exhibit in polarized light the properties required of a monoclinic mineral. In many cases, sections of the supposed augite, which, from all available data, seemed to be cut very nearly at right angles to the vertical axis of the crystal, were found to act abnormally between crossed nicols. A number of instances are given below, mainly from well-known European localities, where this abnormal action was noticed. In each of these rocks, at least one section of pyroxene was found, which, without examination in polarized light, would be considered, as determined by the following tests, to be a typical cross-section of augite. In the first place, if, in a given rock, the pyroxene was found to possess a prismatic development, an eight-sided figure with the proper angles was required. Parallel to two of these outlines there must be a very distinct cleavage, the angles formed by cleavage planes being measurable at very near  $87^{\circ}$  and  $93^{\circ}$ . By means of the micrometer screw, it could be shown in each case that the cleavage plane lay nearly or quite parallel to the axis of the microscope.

In each of the rocks mentioned below, a section of apparent augite, determined, as above, to be nearly or quite perpendicular to the vertical crystallographic axis, was found to extinguish light between crossed nicols at a very decided angle from the diagonals of the prism. In all cases cited, the section was clear, fresh, and free from all visible disturbing elements. In a few cases, where the maximum of darkness was not very distinct, the interference cross of the calcite plate and the most sensitive colors produced by the quartz plate were used in the determination.

The instances referred to are as follows:

1. *Diabase*.—Ilkendorf, near Nossen, Saxony.
2. *Diabase*.—Near Elbingerode, Hartz Mountains, Germany.
3. *Diabase*.—Burg in Nassau, Germany.
4. *Olivine-diabase*.—Björfvas, Dalarne, Sweden.
5. *Melaphyre*.—St. Wendel on the Nahe, Germany.
6. *Hornblende-andesite*.—Bolvershahn, Siebengebirge, Germany.
7. *Hornblende-andesite*.—Jakuben, near Tetschen, Bohemia.
8. "*Augite-andesite*."—Mount Cotopaxi, Ecuador, South America.

9. "*Dolerite*."—Löwenburg, Siebengebirge, Germany.
10. "*Dolerite*."—The Meissner, Hessen, Germany.
11. *Feldspar-basalt*.—Bildstein, Vogelsberg, Germany.
12. *Feldspar-basalt*.—Holmestrand, Sweden.
13. *Nephelinite*.—Meiches, Vogelsberg, Germany.
14. *Feldspar-basalt lava*.—Mount Ætna, eruption of 1537.
15. *Nepheline-basalt*.—Robschitz, near Bilin, Bohemia.
16. *Nepheline-basalt*.—Herchenberg, Laacher See, Germany.
17. *Leucite-basalt*.—The Abtei, Laacher See, Germany.
18. *Leucite-basalt*.—Veitskopf, Laacher See, Germany.
19. *Leucite-basalt*.—Niedermendig, Laacher See, Germany.
20. *Häüyne-basalt*.—Cranzahl, Saxony.
21. *Leucite lava*.—Mount Vesuvius, old eruption.

In very many other cases the same behavior was noticed, but less decidedly. Especially in comparison with the hornblende of diorite, porphyrite, &c., is the abnormal behavior of pyroxene noticeable.

So far as is known to the writer, this abnormal action of supposed augite has never been dwelt upon, if indeed it has been noticed at all. None of the available material contains the questionable mineral, in size or perfection, suitable for isolation and crystallographic investigation; hence the correctness of the view here advanced, that it is triclinic, cannot be proven. The only other explanation possible is that of an "optical anomaly."

If this mineral be triclinic in crystallization, it is manifestly different from either Babingtonite or Szabóite, the only known triclinic pyroxenes, and forms a new species, whose chemical composition does not, in all probability, vary greatly from that of common augite. The variations in optical behavior suggest an analogy with the triclinic feldspars.

Whether the observed behavior be finally explained in accordance with the hypothesis here advocated or not, an interesting and important subject for further investigation is certainly indicated.

#### CHEMICAL COMPOSITION OF THE ROCK.

The rock selected for chemical analysis is that occurring in place on the northeast shoulder of the main Buffalo Peak. (Coll. No. 144.) For a description of its structure and constituents see page 19. The rock was very fresh, and the minerals recognized in it are plagioclase, two pyroxenes, magnetite, and a little apatite. Between these is a brownish glassy base.

The specific gravity was taken at a temperature of 16° C. The analy-

sis was made by Mr. W. F. Hillebrand, chemist to the Rocky Mountain Division of the Survey.

|                                      |              |
|--------------------------------------|--------------|
| Specific gravity.....                | 2.742        |
| SiO <sub>2</sub> .....               | 56.190       |
| Al <sub>2</sub> O <sub>3</sub> ..... | 16.117       |
| Fe <sub>2</sub> O <sub>3</sub> ..... | 4.919        |
| FeO.....                             | 4.433        |
| MnO.....                             | trace        |
| CaO.....                             | 6.996        |
| BaO.....                             | trace        |
| SrO.....                             | trace        |
| MgO.....                             | 4.601        |
| Na <sub>2</sub> O.....               | 2.961        |
| K <sub>2</sub> O.....                | 2.368        |
| H <sub>2</sub> O.....                | 1.028        |
| P <sub>2</sub> O <sub>5</sub> .....  | 0.266        |
| Cl.....                              | 0.022        |
|                                      | <hr/> 99.901 |

There is but little in the analysis which requires special explanation. The percentage of K<sub>2</sub>O is considerably larger than would be expected, as none of the larger crystals of feldspar can be considered as sanidine. The amount of P<sub>2</sub>O<sub>5</sub> found, with the Cl, indicates that minute needles of apatite must be quite abundant in the groundmass, though but few can be recognized as such. BaO and SrO are seldom given in analyses of andesites—probably, in many cases, because they were not sought for.

#### ISOLATION AND ANALYSIS OF HYPERSTHENE.

In order to establish the identity of the pyroxene, which seemed from its optical behavior to be rhombic, an attempt was made to isolate the same for analysis. It is scarcely necessary to mention in this connection that the desire to compare the Buffalo Peaks rock with the hypersthene-bearing andesite of the volcano of Santorin in the Grecian archipelago led to the chemical investigations which follow; and it may be safely assumed that the chief results of the investigations of Fouqué on the Santorin lavas are known even to those to whom the final volume, with its wealth of minute observations and splendid illustrations, is not accessible.<sup>2</sup>

INVESTIGATIONS OF FOUQUÉ ON THE LAVAS OF SANTORIN.—Fouqué found that the lava of the eruption of 1866, which at first glance seemed a typical augite-andesite, contained in reality two pyroxenes, which he isolated and determined as normal augite and *hypersthene*. He also found hypersthene in older rocks of this same volcanic group. It is the first

<sup>2</sup>F. Fouqué, "Santorin, et ses éruptions", Paris, 1879.

instance where the presence of a rhombic pyroxene in "augite-andesite" has been chemically and optically proved beyond dispute.

As the so-called Thonlet solution of the iodide of mercury in the iodide of potassium was not available at the time the investigations were in progress, recourse was had to the method employed by Fouqué (*l. c.*, p. 190) in separating the iron-bearing minerals of the Santorin lavas from the other constituents.

**METHOD USED IN ISOLATION OF HYPERSTHENE.**—A specimen of the rock was crushed until all passed through a sieve containing sixty meshes to the inch. Only that portion of the powder was used which was retained by a sieve having eighty meshes to the inch, as uniformity in size of the grains acted upon by the acid is desirable, and the finer powder is objectionable on several accounts (see Fouqué, *l. c.*). The grains thus obtained were placed in a platinum dish, and treated with strong fluorhydric acid, which attacks first the feldspars and other substances free from or poor in iron. According to Fouqué, concentrated acid is best, in which case, in pouring the powder, little at a time, into the acid, there is a more or less violent ebullition without the application of external heat. On the ceasing of this ebullition it may be presumed that a large part, if not all, of the easily attacked minerals is dissolved. The action is stopped by dilution with water. If matter still remains which it is desired to remove, the water is poured off and the powder treated again with acid. In the present case the acid was not concentrated, and hence considerable heating was necessary. In all cases the powder should be rapidly stirred with a platinum spatule. On discontinuing the action of the acid, there is always more or less gelatinous silica deposited upon the remaining grains. This is removed by repeated washings and rubbing of the powder under water with the finger. The magnetite is then separated with a small magnet.

A specimen of the Buffalo Peaks rock (Coll. No. 144) of which the complete analysis was made, treated as above at different times, yielded a powder in which there were only a few white grains remaining. The acid did not seem to attack them very readily, and before they entirely disappeared a considerable portion of the pyroxene was also dissolved. The residue was finally obtained quite pure, and yielded upon analysis the results under I and II below. Fouqué found (*l. c.*, p. 195) that if the mixture of augite and hypersthene derived from the Santorin lava were further treated with fluorhydric acid, the augite was much more easily attacked, as it contained less iron, and that he could in this way finally obtain hypersthene with but little admixture of augite. In the present case the microscope showed a large amount of augite with the rhombic mineral, in the rock section, but the analysis shows the substance analyzed to have been nearly pure hypersthene; hence, it is presumable that the quantity of pyroxene which was dissolved in removing the white grains above referred to must have been chiefly augite. Microscopic examination of

material left in Analysis I (which has been made since this was written), after the feldspar had disappeared, showed a decided admixture of augite with hypersthene; the augite was, however, removed by further treatment with acid.

Another specimen from the Buffalo Peaks, from a boulder in the tufa beds (Coll. No. 150), was treated in the same manner. This rock was chosen because the microscope showed a large amount of very pure rhombic pyroxene and but little augite. The powder obtained was examined with the microscope and found to be almost absolutely free from impurities. Its analysis is given under III.

MICROSCOPIC INVESTIGATION OF ISOLATED MATERIAL.—The microscopic study of the isolated crystals and fragments shows clearly the rhombic nature of the mineral in question. The crystals obtained are often  $0.3\text{mm}$  in length, and  $0.15\text{mm}$  in thickness. In all those suspected of being rhombic, the pleochroism is much stronger than has been described for the sections observed in the slide. (See p. 21.) The changes in color are from a dark reddish-brown to a very distinct green, instead of from greenish-yellow to pale green. Every such prism extinguishes light, parallel to the vertical axis. The grains of augite are more of a bottle-green color, and only very faintly pleochroic. In the material obtained from specimen (Coll. No. 150) affording III, probably not more than one per cent. of the grains are augite. Many prisms are quite perfect, and it would not be at all difficult to isolate a large number of little crystals of almost the exact appearance of those reproduced by Fouqué in Plate LX, Fig. 2, of his previously cited work. The crystals in the Buffalo Peaks rock are usually stouter than most of those pictured by Fouqué, but are quite as regular in form. Fig. 9 of Plate II shows a crystal from the thin section of the rock which furnished the material for Analysis III.

ANALYTICAL TABLE.—For comparison, the composition obtained by Fouqué for the hypersthene of the Santorin lava of 1866 is given under IV; under V the analysis of the "augite" from the "augit-andesit" of the highest peak of the "Sierra de Mariveles" in the island of Luzon, given by Oebbeke;<sup>3</sup> and under VI, the analysis by Damour of the well-known hypersthene from St. Paul's Island, on the coast of Labrador, as given by Dana.<sup>4</sup>

The isolation of the hypersthene, and Analyses III and III, were carried out by Mr Hillebrand.

---

<sup>3</sup>K. Oebbeke, *Neues Jahrbuch*, etc., I Beilage Band., p. 451 (1881).

<sup>4</sup>J. D. Dana. *A System of Mineralogy*, fifth edition, p. 210.

## ANALYSES.

|         | I.—Buffalo Peaks. | II.—Buffalo Peaks. | III.—Buffalo Peaks. | IV.—Santorin. | V.—Tuzon. | VI.—Saint Paul's. |
|---------|-------------------|--------------------|---------------------|---------------|-----------|-------------------|
| Sp. Gr. | .....             | .....              | 3.307               | 3.477         | .....     | .....             |
| .....   | 51.703            | 51.157             | 50.043              | 50.12         | 51.50     | 51.36             |
| .....   | 1.720             | 2.154              | 2.906               | 2.12          | 3.80      | 0.37              |
| .....   | 0.304             | .....              | .....               | 1.60          | 2.80      | .....             |
| .....   | 17.995            | 18.360             | 17.812              | 23.59         | 10.66     | 21.27             |
| .....   | 0.363             | 0.363              | 0.120               | .....         | 0.75      | 1.32              |
| .....   | 2.873             | 3.612              | 6.096               | 10.49         | 10.45     | 3.00              |
| .....   | 25.001            | 24.251             | 21.744              | 11.05         | 19.09     | 21.31             |
| .....   | .....             | .....              | 0.274               | 0.67          | .....     | .....             |
| .....   | 100.049           | 100.007            | 99.595              | 99.64         | 99.65     | 98.72             |

The specific gravity of III was taken at 23° C.

**DISCUSSION OF ANALYSIS.**—In I and II the alkalis were not tested, and in II and III all the iron is given as FeO, because the special termination of the protoxide was not successful. The amount of Fe<sub>2</sub>O<sub>3</sub> present, is in all probability about the same as in I. The amount of iron derived from grains of magnetite included in the pyroxenes of II and I is small. The crystals are unusually free from inclusions of all kinds. The M<sub>2</sub>O of II is taken from I, and is undoubtedly very nearly correct. The portions analyzed being derived from the same rock. In III is included a small amount of feldspar attached to hypersthene grains, and which could not be dissolved without losing too much of the latter mineral.

On comparing II and III with the other analyses of the table, it is clear that they are much nearer to typical hypersthene (VI) in composition than the rhombic mineral of the Santorin lava, whose identity with hypersthene has been recently admitted, even by Rosenbusch,<sup>5</sup> who had at first expressed doubts upon the subject.<sup>6</sup> The varying quantities of CaO in I, II, III, and IV may indicate that the simple silicate, CaSiO<sub>3</sub>, enters more largely into the composition of rhombic pyroxene, as occurring in rocks, than has heretofore been supposed.

The only instance since the work of Fouqué, known to the writer, where the pleochroic pyroxene of an "augite-andesite" has been isolated and examined with regard to its crystal system, is in the case of the rock from the Sierra de Mariveles, which was investigated by Oebbeke (*l. c.*), and which gave Schwager the composition V of the table. Oebbeke finally pronounces the mineral to be augite and not hypersthene. In this case, as in those mentioned later (p. 34), the grounds given for the determination are by no means satisfactory. The only evidence given by Oebbeke in favor of the monoclinic system is the following:

<sup>5</sup>Review of Fouqué's work on Santorin, in Neues Jahrbuch, etc., 1880, II, p. 310.

<sup>6</sup>Rosenbusch, *Massige Gesteine*, p. 418.



He examined a few of the isolated pleochroic prisms by attaching them singly to a piece of wax in such a manner that he could test the direction of extinction parallel to each face of the prismatic zone, and in each crystal examined he found oblique extinction in some position. The writer found, on examining the material which furnished Analysis III, that many pleochroic prisms did not give definitely an extinction parallel to the vertical axis when lying loosely on an object glass in air; but that the same grains mounted in balsam were much more clear and distinct in their optical behavior, and always in favor of the rhombic system. In the case of such tiny grains, especially when obtained by the crushing of rock to powder, the examination of optical properties in the air is very unsatisfactory. The reflection of light from uneven surfaces, the disturbing influence of fissures, of included substances, &c., all tend to make the optical examination of minute particles in air unreliable. If mounted in balsam, the liability to error is much less.

The substance which yielded the composition V was isolated by means of the Thoulet solution, and would represent a mixture of rhombic and monoclinic pyroxenes, were both present in the rock. The figures of V are certainly abnormal for any augite known to occur as a rock constituent, but are easily explained on the supposition of a mixture of augite with a bronzite or hypersthene.

## CHAPTER II.

### RHOMBIC PYROXENE IN OTHER ANDESITES.

The resemblance of the Buffalo Peaks rock to that variety of augite-andesite which has always been regarded as most typical, naturally demanded that all available examples of the latter should be examined in regard to the character of the pyroxenic constituent. The particular variety referred to is that characterized by a glassy base, often brownish in color, in which lie a multitude of minute microlites of plagioclase and pyroxene, with magnetite grains. The same minerals occur in porphyritic individuals, though by no means so prominently as in other varieties of andesite. Hornblende and biotite are often entirely wanting and are rarely abundant. Olivine appears occasionally. This variety is especially abundant in Hungary, Transylvania, and Servia.

As many of the rocks examined come from well-known European localities, the observations in each particular case will be concisely given. Unfortunately, only their sections, without hand specimens, were available.<sup>7</sup>

In each section the attempt was made to observe and record the direction of total extinction in every prismatic section of pyroxene of sufficient size to allow exact determination.

**TABULATED RESULT OF OBSERVATIONS ON AUGITE-ANDESITES.—**  
The ratio of prismatic sections with rhombic, to those with monoclinic optical orientation, was found to be in the rock from:

|                                                                       |           |
|-----------------------------------------------------------------------|-----------|
| (1) Bobunitz, near Schemnitz, in Hungary .....                        | as 8: 2   |
| (2) Podhrad, near Schemnitz, in Hungary .....                         | as 15: 5  |
| (3) Bagonya, near Schemnitz, in Hungary .....                         | as 13: 6  |
| (4) "Gönczer Thal," near Schemnitz, in Hungary .....                  | as 21: 1  |
| (5) Ober Fernezely, northeast from Nagy-Banya, Hungary .....          | as 15: 2  |
| (6) Roszaj-Ingnies, northeast from Nagy-Banya, Hungary .....          | as 8: 5   |
| * (7) Southeast of Rank, Abanjer Comitát, Hungary .....               | as 47: 11 |
| * (8) Magos Ter, Abanjer Comitát, Hungary .....                       | as 43: 17 |
| * (9) Between Tuhrina and Czervenicza, Saroser Comitát, Hungary ..... | as 24: 6  |

<sup>7</sup> For Nos. 1, 2, 3, 4, 5, 6, and 13, the writer is indebted to Prof. F. Zirkel, of Leipzig. Nos. 10, 11, and 12 are contained in the "Sammlung No. 6, von typischen vulkanischen Gesteinen aus Ungarn und Serbien," prepared and sold by R. Fuess, in Berlin. The material is said to have been selected and described by Prof. J. Szabó, in Budapest.

\* Nos. 7, 8, and 9 are rocks sent by the "K. K. geologischen Reichsanstalt" of Austria to the United States Geological Survey of the Fortieth Parallel, and were kindly

- |                                                    |                                                                |
|----------------------------------------------------|----------------------------------------------------------------|
| (10) Tokajer Berg, Northeastern Hungary.....       | } None distinctly<br>monoclinic<br>could be found.<br>as 10: 5 |
| (11) Lorinczi, Mátra Gebirge, Central Hungary..... |                                                                |
| (12) Borač, Southern Servia.....                   |                                                                |
| (13) Mount Cotopaxi, Ecuador, South America.....   |                                                                |

DISCUSSION OF TABLE.—In Nos. 4, 5, and 6, only the larger sections were counted. There are many of about 0.4<sup>mm</sup> to 0.5<sup>mm</sup> in length, all of which extinguish light parallel to the vertical axis.

The few sections in which the optical behavior was not distinct were neglected.

The microlites of pyroxene, in cases where they could be tested, seemed for the most part to be monoclinic, but the determination was seldom satisfactory.

It appears, therefore, that in all those cases mentioned above, a rhombic pyroxene is much more abundant in porphyritic individuals than augite. For it cannot be supposed that such constant results could be obtained through mere chance. It is true that sections of augite parallel to the orthopinacoid are not to be distinguished optically from rhombic pyroxene, but it is not possible to explain the above figures in that way.

The same difference in appearance between the two pyroxenes is to be noticed in the above rocks which was described in the case of the Buffalo Peaks andesite. The rhombic mineral is pleochroic in the same manner (p. 21), while the monoclinic is not noticeably so. There is also a difference in development. The rhombic pyroxene, which, through analogy with the cases described, will be hereafter designated as hypersthene, is better developed than the augite. Its crystals show terminations as if from domes quite frequently, and its cross-sections are sharper, being chiefly bounded by pinacoidal outlines. The augite grains are much more irregular as a rule, and contain glass and magnetite inclusions in greater abundance than the hypersthene crystals. An apparent intergrowth of the two was not unfrequently noticed, as in the rocks from Bohunitz and Roszaj-Ingnies.

AUGITE-ANDESITES OF THE 40TH PARALLEL.—Through the courtesy of Mr. Arnold Hague the slides of the andesitic rocks collected during the geological exploration of the Fortieth Parallel, and which have been described by Prof. F. Zirkel,<sup>9</sup> were placed at the disposal of the writer. The results obtained from the examination of these slides agree fully with what has been stated concerning the European rocks. In all but two of those rocks described by Professor Zirkel as "augite-andesites" a very large part of the pyroxene seems identical

loaned to the writer by Mr. Arnold Hague, United States Geologist, the custodian of the collections belonging to the Fortieth Parallel Survey. The rocks bear respectively the numbers 24, 25, and 19 of the Austrian Survey, and are labeled "Grauer Trachyt, Richthof." They are all typical rocks, in fresh condition, of the class under discussion.

<sup>9</sup>F. Zirkel, *Microscopical Petrography*. Washington, 1876, p. 221.

with that which is regarded as probable hypersthene in the above rocks. The two exceptions (Mic. Nos. 514 and 515) are basaltic in habitus and carry olivine.

#### PREVIOUS OBSERVATIONS OF RHOMBIC PYROXENE IN AUGITE-ANDESITES.

**HISTORICAL.**—The number of instances known to the writer where the presence of rhombic pyroxene in "augite-andesites" has been at all emphasized is extremely small. J. Niedzwiedski<sup>10</sup> described in 1872 a rock from St. Egidi, in Steiermark, as "Hypersthen-Andesit." In 1877 this rock is mentioned by Rosenbusch<sup>11</sup> as the single rock known which can bear that name. In 1880 E. Hussak<sup>12</sup> pronounced it an ordinary augite-andesite, and, so far as the writer is aware, his verdict has not been questioned. Reference will again be made to this case later.

The occurrence of rhombic pyroxene even as an accessory constituent of augite-andesites has been but rarely announced.

R. von Drasche<sup>13</sup> has mentioned bastite as occurring in augite-andesite from Videna, in Steiermark.

Rosenbusch<sup>14</sup> at the time of issuing his often cited work (1877), while not denying that a rhombic pyroxene may occur in augite-andesites, is still inclined to consider those pleochroic prismatic sections of pyroxene in which light is extinguished parallel to the vertical axis, as chance sections of augite parallel to the ortho-pinacoid. It is in great measure owing to this judgment, no doubt, and to the undoubted presence of pleochroic augite in recent rocks, that many observers have seemed to dismiss all thoughts of rhombic pyroxene if in the same slide with pleochroic sections, such as have been described, normal augite with its oblique extinction could be found. Thus, E. Hussak (*l.c.*) disposes of the hypersthene andesite of Niedzwiedski with the simple assertion that the pyroxene is monoclinic, because he has found apparent prismatic sections in which extinction took place at more than 30° from the vertical axis. Inasmuch as he had previously confirmed the statements of von Drasche<sup>15</sup>, it seems highly probable that augite is not specially abundant in this andesite.

<sup>10</sup>J. Niedzwiedski, *Tschermak's Min. und pet., Mittheilungen*, IV, 1872, p. 253.

<sup>11</sup>H. Rosenbusch, *Massige Gesteine*, p. 480.

<sup>12</sup>E. Hussak, *Neues Jahrbuch für Mineralogie, etc.*, 1880, I. p. 289.

<sup>13</sup>R. von Drasche, *Tschermak's Min. und pet. Mitth.*, 1873, V. p. 1.

<sup>14</sup>H. Rosenbusch, *Massige Gesteine*, p. 411.

<sup>15</sup>E. Hussak, *Verhandl. d. k. k. Geol., Reichsanstalt, Vienna*, 1878, p. 338.

Hussak<sup>16</sup> has also published the results of microscopic investigations on the eruptive rocks of the region about Schemnitz, in Hungary. While the rocks of this district have been frequently studied by eminent investigators, such as Zirkel, vom Rath, and Doelter, the publication of Hussak is here considered as the most recent known to the writer. Augite-andesite, of the type especially under consideration, is very abundant near Schemnitz. Hussak mentions a large number of occurrences, among them those of Bohunitz and Podhrad, and the great similarity of most of them is evident. The pyroxenic constituent is always called augite, although some of it extinguishes light parallel to the vertical axis. Decomposition products resembling bastite were also noticed. The pleochroism is quite strong and the pinacoids are markedly predominant. The angle of extinction in two cases is given as  $47^\circ$  and  $48^\circ$ .

The general description given by Hussak corresponds closely to that required by the two slides in possession of the writer, from Podhrad and Bohunitz, except that no allowance is made for two species of pyroxene.

The short description accompanying the slides of the Fuess collection (see p. 31) mentions no other pyroxene than augite, even in those cases where every prismatic section seems to be rhombic.

The determination of hypersthene in the lavas of Santorin, and the statements of Oebbeke concerning the pyroxene in the "augite-andesites" of the Philippine Islands, have already been cited. (p. 29.)

In all other descriptions of or references to augite-andesite of the chief type which have come under the observation of the writer, it is impossible to obtain satisfactory data concerning the pyroxene. In nearly all of them, however, the pleochroism and predominance of the pinacoids are dwelt upon, which, in the light of the present investigation, justifies the suspicion that rhombic pyroxene is not wanting. Two instances will be given where the existing descriptions of "augite-andesites" suggest the identity of the supposed "augite" with the rhombic pyroxene of the rocks here described.

Rosenbusch<sup>17</sup> mentions that the augite of the "augite-andesites" from Chimborazo and Tunguragua, in the Andes of South America, is strongly pleochroic. Artopé<sup>18</sup> has given analyses of several augite-andesites from the Andes, among them being two from Tunguragua. One of these shows nearly 6 per cent. MgO, while in two other cases nearly 4 per cent. MgO is given. The augite-andesite from Cotopaxi, examined by the writer, showed 10 apparently rhombic pyroxenes to 5 monoclinic.

Again, Cohen<sup>19</sup> describes the porphyritic augite crystals of two Ha-

<sup>16</sup>E. Hussak, Sitzungsbericht d. k. Akad. d. Wiss., Vienna, July, 1880, p. 164.

<sup>17</sup>Rosenbusch, *Massige Gesteine*, p. 420.

<sup>18</sup>Artopé, "Über augithaltige Trachyte der Anden," 1872. Göttingen.

<sup>19</sup>E. Cohen, "Über Laven von Hawaii," etc., *Neues Jahrbuch*, etc., 1880, II, pp. 38 and 54.

waiian andesites as "*kräftig pleochroitisch*" in the same manner shown in the Buffalo Peaks hypersthene, while the microlites in the groundmass do not seem to be so. Also, the augite of an "*Augitandesitbimstein*" found between New Britain and New Ireland, in the South Pacific Ocean, is strongly pleochroic in the same manner.

#### RHOMBIC PYROXENE IN DIABASIC ROCKS.

The possibility that a rhombic pyroxene may occur in some augite-andesites has been admitted by Rosenbusch,<sup>20</sup> who, while denying that the pleochroic pyroxene, so common in augite-andesites, is rhombic, expresses a belief that the final discovery of a rhombic pyroxene in a subgroup of the augite-andesites is even highly probable. This probability arises out of analogy with the diabase-porphyrates of the left bank of the Lower Rhine, which contain enstatite. It is interesting and significant that this analogy is borne out in Colorado.

**ENSTATITE-BEARING DIABASE FROM COLORADO.**—At Morrison, near Denver, there is in the Archæan gneiss a narrow dike of a dark aphanitic rock. Under the microscope this rock is seen to consist chiefly of narrow prisms of plagioclase and a colorless pyroxene. The angular spaces between these are filled in part with a colorless anisotropic mineral, which may be orthoclase, and with a dark groundmass. The ore is apparently magnetite, and is almost exclusively confined to the groundmass, where it occurs in regular aggregations, and seldom in single grains. These aggregations seem often like devitrification products, and a glass base is in places to be identified. The pyroxene occurs chiefly in prisms of about 1<sup>mm</sup> in length by 0.2<sup>mm</sup> in thickness. All such individuals are colorless, have numerous cross-fissures, and extinguish light when the vertical axis is parallel to the principal section of one of the crossed nicols. The cross-sections show a dominant development of the pinacoids. The cleavage is most pronounced parallel to the prism, but there are many irregular fissures, and some parallel to the pinacoids.

The absolute identity of this mineral with enstatite has not been proven, but there seems to be no good reason for doubting it. The remaining pyroxene is in smaller prisms and has a very slight pinkish color. Nearly all of these prisms have an angle of extinction exceeding 30°, and they belong undoubtedly to augite.

The age of this rock cannot be determined, but it has throughout the habitus of a Pre-Tertiary eruptive.

#### RHOMBIC PYROXENE IN HORNBLENDE-ANDESITE.

The presence of a rhombic pyroxene in the hornblende-biotite-andesites has been seldom announced.

---

<sup>20</sup>Rosenbusch, *Massige Gesteine*, p. 411.

Rosenbusch<sup>20</sup> found it in one dacite; Lagorio<sup>21</sup> found pyroxene in certain andesites of the Caucasus which acted optically like a rhombic mineral, yet he does not pronounce it such.

In the hornblende-andesite from Buffalo Peaks, pyroxene, wholly analogous to that of the hypersthene-andesite, is quite abundant. In the tufas of the same locality hypersthene is often associated with hornblende and biotite.

A slide in the possession of the writer, from Moisar (Mocsar?), in Hungary, shows hornblende, biotite, and apparent hypersthene. The groundmass of this rock is much less prominent than in the typical "augite-andesites," yet seems to be essentially of the same character, and the occurrence may represent a transition form.

The Fuess collection (see note, p. 29) contains two beautiful hyaline andesites from Gornj Milanovatz, and Slatni, in Central Servia, in which the pyroxene seems to be rhombic, with scarcely an exception. Hornblende and biotite are abundant in the same. On the other hand, the pyroxene in the andesite from Jakuben, near Tetschen, in northern Bohemia, though strongly pleochroic, is still unmistakably augite. The pleochroism of this augite is, however, very different from that which is characteristic of andesitic hypersthene. Augite, sometimes faintly pleochroic, can often be found in andesites and trachytes of the Siebengebirge, the Auvergne, and other districts, but in these cases sections with rhombic optical action are very rare and cannot be considered as indicating a rhombic mineral.

#### CLASSIFICATION OF ANDESITIC ROCKS.

**NEED OF A RECLASSIFICATION.**—The group of the andesites, including all Tertiary eruptive rocks with plagioclase and one or more of the minerals hornblende, biotite, or pyroxene as essential constituents, is more in need of a natural subdivision than any other in the category of modern petrography. This statement will hardly be disputed.

The division into hornblende and augite-andesites has often been assailed, with justice, on the ground that very many rocks contain hornblende and augite in about equal quantity, making the transition stage of as frequent occurrence as either of the extremes. On the other hand, the division of the augite-andesites has been justly defended, by pointing to the "original," or the typical rock, in which hornblende and biotite seldom play any other than a very subordinate part, and which has been

<sup>20</sup> Rosenbusch, *Massige Gesteine*, p. 300.

<sup>21</sup> A. Lagorio, "Die Andesite des Kaukasus," Dorpat, 1878, p. 18.

found in widely separated parts of the world, with a truly remarkable persistence of characteristics.

A glance at the rocks which, according to the prevailing principles of classification, must be called augite-andesites, shows three subdivisions. At one extreme are those rocks upon whose characteristics the objections to the prevalent classification are grounded. These occurrences, united with the great majority of hornblende-biotite-andesites are usually characterized by a trachytic habitus. In these, feldspar is by far the dominant element, and often sanidin forms an important part of it. The structure of the groundmass is prevailingly much more crystalline than in the so-called augite-andesites proper, and plagioclase is especially abundant in it. Quartz or tridymite is often present.

At the other extreme are the rocks, comparatively few in number, which, though possessing the basaltic habitus, are still strictly andesites through the absence or rarity of olivine. As examples of this class may be cited numerous rocks of the Auvergne described by von Lasaulx,<sup>22</sup> and the rock from the Löwenburg in the Siebengebirge, commonly called "dolerite," but classified by Rosenbusch<sup>23</sup> with the augite-andesites. Between these are the normal "augite-andesites."

Chemically considered, the andesites with trachytic habitus are somewhat different from the normal augite-andesite. The percentage of silica is noticeably higher. Thus Lagorio<sup>24</sup> states concerning the andesites of the Caucasus that they vary in amount of silica from 61.33 to 77.40 per cent. Doelter<sup>25</sup> gives the variation in quartz-bearing andesites of Transylvania and Hungary as from 57 to 69 per cent. The typical augite-andesites seldom contain more than 60 per cent. silica, and the average runs quite constantly between 56 and 58 per cent.<sup>26</sup>

The separation of the normal augite-andesites from those with trachytic habitus has often been justified by their geognostic relations. Near Schemnitz, in Hungary, where both types are abundantly represented, the augite-andesites proper were long ago distinguished as "*trachytes semiritreux*" by Bendant. Von Andrian states as a result of the geological survey of the region in 1865, speaking of the "*jüngere andesite*," that "*Übergänge in den (amphibol-) andesit lassen sich auch da, wo beide neben einander vorkommen, nicht nachweisen.*" (Cited as above by Hussak (l. c.)) In many other places the normal augite-andesite has been distinguished from the "trachytic" variety, as younger.

<sup>22</sup> A. v. Lasaulx, Neues Jahrbuch für Min., etc., 1870, p. 693, and 1871, p. 673.

<sup>23</sup> Rosenbusch, Massige Gesteine, p. 416.

<sup>24</sup> A. Lagorio, "Die Andesite des Kaukasus," Dorpat, 1878, p. 13.

<sup>25</sup> C. Doelter, Tschermak's Min. und pet. Mitth., V. 1873, p. 51.

<sup>26</sup> F. Zirkel, Mic. Pet. of 40th Par., p. 222; also the well-known tables compiled by J. Roth.



## RESULTS.

1. An apparently typical augite-andesite from the Buffalo Peaks is found to contain *hypersthene* as its chief pyroxenic constituent.

2. The remaining pyroxene of this rock must, from its optical behavior, be considered either as *triclinic* in crystallization, or as augite with anomalous action through some unexplained cause. The occurrence of apparent twins and of intergrowth with hypersthene render the *former* explanation most plausible. Pyroxene with similar behavior was found in many well-known augitic rocks.

3. In all so-called "augite-andesites" of the truly typical character which are accessible to the writer, twenty-eight in number, the greater part of the pyroxene corresponds optically and structurally to the hypersthene of the Buffalo Peaks rock.

4. There is nothing in the current description of the "augite-andesites" referred to, which can be regarded as *positive* evidence that hypersthene is not abundant in them.

5. In all so-called "hornblende-andesites" with a structure similar to that of the typical "augite-andesites" which were examined, some fifteen in number, the same apparent hypersthene is more or less abundant.

6. The pyroxene of those andesites with "trachytic habitus" seems to be normal augite.

7. The conclusion is that the chief subdivision of the augite andesites may much more properly be called *hypersthene-andesite*. To this latter group are to be added certain rocks containing hypersthene, which have been classed with the hornblende-andesites. A separation of the remaining andesites into augite and hornblende-biotite bearing groups does not appear justifiable.

It does not seem probable that future investigations will show the occurrence of hypersthene to be so closely connected with a certain structural form as is indicated by the preceding observations. If, however, it should prove to be the case, the group of the hypersthene-andesites will be one of the best defined in petrography.

It is hoped that the correctness or falsity of the above conclusion will be speedily settled by other determinations of the nature of the pyroxene in the so-called augite-andesites.

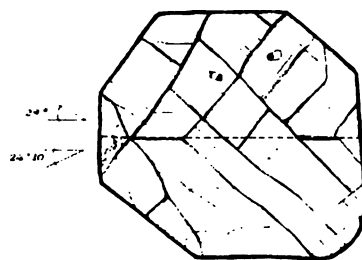
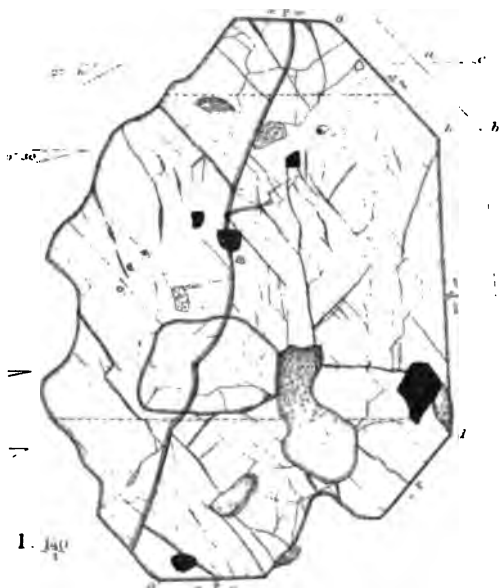


Fig. 3. 195



Fig. 6. 43

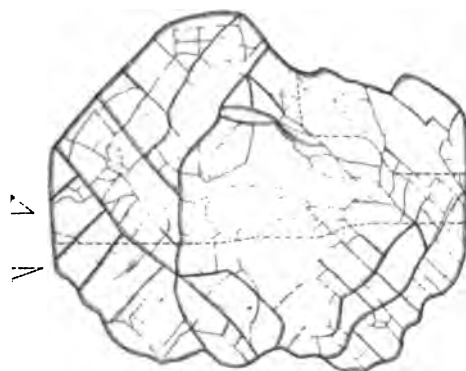


Fig. 2. 140

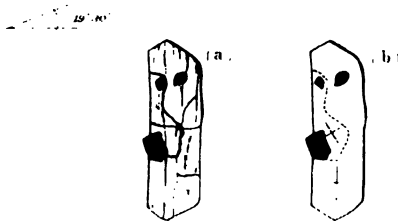


Fig. 5. 140



Fig. 4. 140



Fig. 7. 42



Fig. 8. 43



Fig. 9. 43



# INDEX.

|                                                                    | Page.                  |
|--------------------------------------------------------------------|------------------------|
| Abtei, Laacher See, Germany, Leucite-basalt from .....             | 25                     |
| Ætna eruption of 1537, Basalt from .....                           | 25                     |
| Analysis of hypersthene .....                                      | 29                     |
| Analysis of hypersthene-andesite .....                             | 26                     |
| Andesitic rocks, Classification of .....                           | 36                     |
| Andesites, Relative age of .....                                   | 16                     |
| Archæan granite .....                                              | 13                     |
| island .....                                                       | 11                     |
| Augite-andesite defined .....                                      | 37                     |
| , Triclinic pyroxene in .....                                      | 24                     |
| Authors : Andrian, von; geological survey of Schemnitz .....       | 37                     |
| : Artopé; analysis of augite-andesites from the Andes .....        | 34                     |
| : Bendant; <i>trachytes semivitreux</i> of Schemnitz .....         | 37                     |
| : Cohen, E.; Hawaiian andesites .....                              | 35                     |
| : Dana, J. D.; analysis of hypersthene .....                       | 28                     |
| : Doelter, C., on rhombic pyroxene in augite-andesite .....        | 34, 37                 |
| : Drasche, R. von, on rhombic pyroxene in augite-andesite .....    | 33, 34                 |
| : Fouqué, F., on the lavas of Santorin .....                       | 26, 28                 |
| : Fuess, R.; hyaline andesite slides .....                         | 31, 36                 |
| : Hague, Arnold, on augite-andesites of 40th parallel .....        | 32                     |
| : Hillebrand, W. F.; analysis of hypersthene .....                 | 28                     |
| : Hussak, E., on hypersthene-andesite .....                        | 33, 34, 37             |
| : Lagorio, A., on pyroxene in andesite from the Caucasus .....     | 36, 37                 |
| : Lasaulx, A. von, on rocks of the Auvergne .....                  | 37                     |
| : Niedzwiedski, J.; hypersthene-andesite .....                     | 33                     |
| : Oebbeke .....                                                    | 28, 29, 34             |
| : Rath, Von, on rhombic pyroxene in augite-andesite .....          | 34                     |
| : Richthofen; classification of volcanic rocks .....               | 17                     |
| : Rosenbusch, H., on hypersthene-andesite .....                    | 29, 33, 34, 35, 36, 37 |
| : Roth, J. Tables compiled by .....                                | 37                     |
| : Schwager, Tables compiled by .....                               | 29                     |
| : Szabo, J., selected and described augite-andesite .....          | 31                     |
| : Zirkel, F., on augite-andesite .....                             | 31, 33, 34, 37         |
| Auvergne, Rhombic-pyroxene in andesite and trachyte from the ..... | 36                     |
| Babingtonite .....                                                 | 25                     |
| Bagonya near Schemnitz, Hungary, Augite-andesites from .....       | 31                     |
| Baryta in andesite .....                                           | 26                     |
| Basalt, Triclinic pyroxene in .....                                | 23, 25                 |
| Bastite in augite-andesite .....                                   | 33                     |
| Bendant; <i>trachytes semivitreux</i> of Schemnitz .....           | 37                     |
| Bildstein, Vogelsberg, Germany, Basalt from .....                  | 25                     |
| Björfvas, Delarue, Sweden, Diabase from .....                      | 24                     |
| Black Hill, Geologic structure of .....                            | 12                     |
| Bohunitz near Schemnitz, Hungary, Augite-andesite from .....       | 31                     |
| Bolverschahn, Siebengebirge, Germany, Andesite from .....          | 24                     |
| Borac, Southern Servia, Augite-andesite from .....                 | 32                     |

|                                                                    |       |
|--------------------------------------------------------------------|-------|
| Buffalo Peaks, <sup>*</sup> Elevation of.....                      | 1     |
| , General structure of.....                                        |       |
| , Relics of a crater on.....                                       |       |
| , Section of.....                                                  |       |
| , View of.....                                                     |       |
| Burg in Nassau, Germany, Diabase from.....                         |       |
| Cambrian quartzite, Thickness of.....                              |       |
| Carboniferous or Blue Limestone, Thickness of.....                 |       |
| Caucasus, Andesites from.....                                      | 1     |
| Chimborazo, Rhombic pyroxene in augite-andesite from.....          |       |
| Classification of andesitic rocks.....                             |       |
| Coal measures, Upper.....                                          |       |
| Cohen, E.; Hawaiian andesites.....                                 |       |
| Cotopaxi, Ecuador, South America, Augite-andesites from.....       | 24, 1 |
| Cranzahl, Saxony, Basalt from.....                                 |       |
| Dacite (rhyolite?).....                                            |       |
| Dana, J. D.; analyses of hypersthene.....                          |       |
| Diabase, Triclinic pyroxene in.....                                |       |
| Doelter, C., on rhombic pyroxene in augite-andesite.....           | 1     |
| Dolerite, Triclinic pyroxene in.....                               |       |
| Drasche, R. von, on rhombic pyroxene in augite-andesite.....       | 1     |
| Elbingerode, Hartz, Germany, Diabase from.....                     |       |
| Enstatite in diabase from Colorado.....                            |       |
| Erosion, Glacial.....                                              |       |
| Fluorhydric acid, Separation by.....                               |       |
| Fortieth parallel, Augite-andesite of.....                         |       |
| Fouqué F., on the lavas of Santorin.....                           | 1     |
| Fuess, R.; hyaline andesite slides.....                            | 1     |
| Fulgurite of Buffalo Peaks.....                                    | 1     |
| Glacial erosion.....                                               |       |
| "Gönczer Thal" near Schemnitz, Hungary, Augite-andesites from..... |       |
| Gorni, Milanovatz, and Slatni, Servia, Hyaline andesite from.....  |       |
| Granite, Archæan.....                                              |       |
| Hague, Arnold, Assistance rendered by.....                         |       |
| Herchenberg, Laacher See, Germany, Nepheline basalt from.....      |       |
| Hillerbrand, W. F.; analyses of hypersthene.....                   |       |
| Holmestrand, Sweden, Basalt from.....                              |       |
| Hornblende-andesite, Peculiarities of pyroxene in.....             |       |
| , Triclinic pyroxene in.....                                       |       |
| Hussak, E., on hypersthene-andesite.....                           | 33, 1 |
| Hyalite of Buffalo Peaks.....                                      |       |
| Hypersthene, Isolation of.....                                     |       |
| Hypersthene-andesite, Chemical composition of.....                 |       |
| , Description of.....                                              |       |
| , Geological occurrences of.....                                   |       |
| Ilkendorf near Noesen, Saxony, Diabase from.....                   |       |
| Island, Archæan.....                                               |       |
| Jakuben, Bohemia, Andesite from.....                               | 1     |
| Lagorio, A., on pyroxene in andesite from the Caucasus.....        | 1     |
| Lasaulx, A. von, on rocks of the Auvergne.....                     |       |
| Leucite lava, Triclinic pyroxene in.....                           |       |
| Limestone altered by solfataric action.....                        |       |
| Little Platte River.....                                           |       |
| Lorinczi, Mátra Gebirge, Hungary, Augite-andesite from.....        |       |
| Löwenburg, Siebengebirge, Germany, Dolerite from.....              | 1     |

|                                                                   | Page.                  |
|-------------------------------------------------------------------|------------------------|
| Lower quartzite .....                                             | 15                     |
| Luzon, Augite-andesite from .....                                 | 28                     |
| Magos Ter, Abanjer Comitat, Hungary, Augite-andesites from .....  | 31                     |
| Meißen, Vogelsberg, Germany, Nephelinite from .....               | 25                     |
| Meissner, Hessen, Germany, Dolerite from .....                    | 25                     |
| Melaphyre, Triclinic pyroxene in .....                            | 24                     |
| Moisar (Moscar?), Hungary, Andesite from .....                    | 36                     |
| Morrison, Colorado, Enstatite-bearing diabase from .....          | 35                     |
| Mosquito Range, Elevation of .....                                | 11                     |
| Nephelinite, Triclinic pyroxene in .....                          | 25                     |
| New Britain, Pleochroic augite in andesite of .....               | 35                     |
| New Ireland, Pleochroic augite in andesite of .....               | 35                     |
| Niedermendig, Laacher See, Germany, Leucite basalt from .....     | 25                     |
| Niedzwiedzie, J.; hypersthene-andesite .....                      | 33                     |
| Oebbke .....                                                      | 28, 29, 34             |
| Ober Fernezely, Hungary, Augite-andesites from .....              | 31                     |
| Olivine, Rarity of, in andesite .....                             | 37                     |
| Opal alteration; product of chalcedony .....                      | 15                     |
| Palaeozoic, Interbedded porphyry in .....                         | 12                     |
| Palaeozoic, Thickness of .....                                    | 11                     |
| Plate I described .....                                           | 13                     |
| Plate II described .....                                          | 21, 28                 |
| Podhrad near Schemnitz, Hungary, Augite-andesites from .....      | 31                     |
| Porphyry in Palaeozoic .....                                      | 12                     |
| Rank, Abanjer Comitat, Hungary, Augite-andesite from .....        | 31                     |
| Rath, Von .....                                                   | 34                     |
| Reclassification of andesites, Need of .....                      | 36                     |
| Reichsanstalt of Austria .....                                    | 31                     |
| Rhombic pyroxene in Buffalo Peak andesites .....                  | 20                     |
| Rhombic pyroxene in diabasic rocks .....                          | 31                     |
| other andesite .....                                              | 35                     |
| , Proportion of, to monoclinic pyroxene in augite-andesites ..... | 31                     |
| Rhyolite, Crystalline .....                                       | 12                     |
| , (Dacite?) .....                                                 | 14, 17                 |
| Richthofen; classification of volcanic rocks .....                | 17                     |
| Robschitz near Bilin, Bohemia, Nepheline-basalt from .....        | 25                     |
| Rosenbusch, H., on hypersthene-andesite .....                     | 29, 33, 34, 35, 36, 37 |
| Rozsa-Jugnies, Hungary, Augite-andesites from .....               | 31                     |
| Roth, J., Tables compiled by .....                                | 37                     |
| Rough-and-Tumbling Creek .....                                    | 12                     |
| St. Egidii in Steiermark, Hypersthene-andesite from .....         | 33                     |
| St. Paul's Island, Hypersthene from .....                         | 28                     |
| St. Wendel on the Nahe, Germany, Melaphyre from .....             | 24                     |
| Santorin, Analysis of hypersthene from .....                      | 29                     |
| , Hypersthene-andesite on .....                                   | 26, 34                 |
| Schwager, Tables compiled by .....                                | 29                     |
| Sheep Ridge .....                                                 | 12                     |
| Siebengebirge, Germany, Dolerite from .....                       | 25, 36                 |
| Sierra de Mariveles, "Augit-andesit" from .....                   | 28                     |
| Silica, Percentage of, in andesites .....                         | 37                     |
| Silurian limestone, Thickness of .....                            | 13                     |
| Sistai, Servia, Hyaline-andesite from .....                       | 36                     |
| Stromia in andesite .....                                         | 26                     |
| Swabe, J., selected and described augite-andesites .....          | 31                     |
| Swabite .....                                                     | 25                     |

# INDEX.

|                                                                         | Page.          |
|-------------------------------------------------------------------------|----------------|
| y eruptive rocks in Colorado .....                                      | 17             |
| t solution .....                                                        | 27, 30         |
| r Berg, Hungary, Augite-andesite from .....                             | 32             |
| aphy, Relation of, to geologic structure .....                          | 12             |
| a South Park .....                                                      | 13             |
| ic pyroxene in andesite .....                                           | 21             |
| other rocks .....                                                       | 23             |
| ite present in andesite .....                                           | 37             |
| eds, Composition of .....                                               | 19             |
| , Section of .....                                                      | 14             |
| a and Czervencza, Saroser Comitát, Hungary, Augite-andesites from ..... | 31             |
| ragua, Rhombic pyroxene in augite-andesite from .....                   | 34             |
| opf, Laacher See, Germany, Lencite basalt from .....                    | 25             |
| us, Lencite lava from old eruption of .....                             | 25             |
| in Steiermark, Bastite in augite-andesite from .....                    | 33             |
| grits .....                                                             | 13, 14         |
| shales .....                                                            | 15             |
| i's Pass, Geologic structure of .....                                   | 12             |
| F., on augite-andesite .....                                            | 31, 33, 34, 37 |













1

## ADVERTISEMENT.

---

The publications of the United States Geological Survey are issued in accordance with the statute, approved March 3, 1879, which declares that—

"The publications of the Geological Survey shall consist of the annual report of operations, geological and economic maps illustrating the resources and classifications of the lands, and reports upon general and economic geology and paleontology. The annual report of operations of the Geological Survey shall accompany the annual report of the Secretary of the Interior. All special memoirs and reports of said Survey shall be issued in uniform quarto series if deemed necessary by the Director but otherwise in ordinary octavos. Three thousand copies of each shall be published for scientific exchanges and for sale at the price of publication; and all literary and cartographic materials received in exchange shall be the property of the United States and form a part of the library of the organization. And the money resulting from the sale of such publications shall be covered into the Treasury of the United States."

### ANNUAL REPORTS.

From the above it will be seen that only the Annual Reports, which form parts of the reports of the Secretary of the Interior and are printed as executive documents, are available for gratuitous distribution. A number of these are furnished the Survey for its exchange list, but the bulk of them are supplied directly, through the document rooms of Congress, to members of the Senate and House. Except, therefore, in those cases in which an extra number is supplied to this office by special resolution, application must be made to members of Congress for the Annual Reports, as for all other executive documents.

Of these annuals there have been already published:

I. First Annual Report to the Hon. Carl Schurz, by Clarence King, 8°, Washington, 1880, 79 pp., 1 map.—A preliminary report describing plan of organization and publications.

II. Report of the Director of the United States Geological Survey for 1880-'81, by J. W. Powell, 8°, Washington, 1882, lv, 588 pp., 61 plates, 1 map.

### CONTENTS.

Report of the Director, pp. i-lv, plates 1-7.

Administrative Reports by Heads of Divisions, pp. 1-46, plates 8 and 9.

The Physical Geology of the Grand Cañon District, by Capt. C. E. Dutton, pp. 47-166, plates 10-36.

Contributions to the History of Lake Bonneville, by G. K. Gilbert, pp. 167-200, plates 37-43.

Abstract of Report on the Geology and Mining Industry of Leadville, Colorado, by S. F. Emmons, pp. 201-290, plates 44 and 45.

A Summary of the Geology of the Comstock Lode and the Washoe District, by George F. Becker, pp. 291-330, plates 46 and 47.

Production of Precious Metals in the United States, by Clarence King, pp. 331-401, plates 48-53.

A New Method of Measuring Heights by means of the Barometer, by G. K. Gilbert, pp. 403-565, plates 54-61.

Index, pp. 567-588.

The Third and Fourth Annual Reports are now in press.

### MONOGRAPHS.

The Monographs of the Survey are printed for the Survey alone, and can be distributed by it only through a fair exchange for books needed in its library, or through the sale of those copies over and above the number needed for such exchange. They are not for gratuitous distribution.

So far as already determined upon, the list of these monographs is as follows:

I. The Precious Metals, by Clarence King. In preparation.

II. Tertiary History of the Grand Cañon District, with atlas, by Capt. C. E. Dutton. Published.

## BULLETIN UNITED STATES GEOLOGICAL SURVEY.

III. Geology of the Comstock Lode and Washoe District, with atlas, by George F. Becker. Published.

IV. Comstock Mining and Miners, by Elliot Lord. In press.

V. Copper-bearing Rocks of Lake Superior, by Professor R. D. Irving. In press.

VI. Older Mesozoic Flora of Virginia, by Prof. Wm. M. Fontaine. In press.

Geology and Mining Industry of Leadville, with atlas, by S. F. Emmons. In preparation.

Geology of the Eureka Mining District, Nevada, with atlas, by Arnold Hague. In preparation.

Coal of the United States, by Prof. R. Pumpelly. In preparation.

Iron in the United States, by Prof. R. Pumpelly. In preparation.

Lesser Metals and General Mining Resources, by Prof. R. Pumpelly. In preparation.

Lake Bonneville, by G. K. Gilbert. In preparation.

Dinocerata. A monograph on an extinct order of Ungulates, by Prof. O. C. Marsh. In press.

Sauropoda, by Prof. O. C. Marsh. In preparation.

Stegosauria, by Prof. O. C. Marsh. In preparation.

Of these monographs, Nos. II and III are published, viz:

II. Tertiary History of the Grand Cañon District, with atlas, by C. E. Dutton, Capt. U. S. A., 1882, 4°, 264 pp., 42 plates, and atlas of 26 double sheets folio. Price \$10.12.

III. Geology of the Comstock Lode and Washoe District, with atlas, by G. F. Becker. 1883. 4°. XV, 422 pp. 7 pl. and atlas of 21 sheets folio. Price, \$11.

Nos. IV, V, and VI are in press and will appear in quick succession. The others, to which numbers are not assigned, are in preparation.

### BULLETINS.

In its Bulletins the Survey will print such papers relating to the general purpose of its work as do not properly come under the heads of ANNUAL REPORTS or MONOGRAPHS.

The Bulletins will each contain but one paper, and be complete in itself. They will, however, be numbered in a continuous series, and will in time be united into volumes of convenient size. To facilitate this each Bulletin will have two paginations, one proper to itself at the top, and at the bottom, one which belongs to it in the volume.

Of this series of Bulletins there has already been published:

1. On Hypersthene-Andesite and on Triclinic Pyroxene in Augitic Rocks, by Whitman Cross, with a Geological Sketch of Buffalo Peaks, Colorado, by S. F. Emmons, Washington, 1883, pp. 1-42, 2 plates, 8°. Price ten cents.

The following paper forms No. 2. Its price is five cents.

Correspondence relating to the publications of the Survey, and all remittances, should be addressed to the

DIRECTOR OF THE UNITED STATES GEOLOGICAL SURVEY,  
Washington, D. C.

WASHINGTON, D. C., August 24, 1883.

DEPARTMENT OF THE INTERIOR

---

BULLETIN

OF THE

UNITED STATES

GEOLOGICAL SURVEY

No. 2



WASHINGTON  
GOVERNMENT PRINTING OFFICE  
1883





UNITED STATES GEOLOGICAL SURVEY

J. W. POWELL DIRECTOR

---

GOLD AND SILVER

CONVERSION TABLES

GIVING THE

COINING VALUES OF TROY OUNCES OF FINE METAL, AND THE  
WEIGHTS OF FINE METAL REPRESENTED BY GIVEN  
SUMS OF UNITED STATES MONEY

COMPUTED BY

ALBERT WILLIAMS, Jr.,  
CHIEF OF DIVISION OF MINING STATISTICS AND TECHNOLOGY



WASHINGTON  
GOVERNMENT PRINTING OFFICE  
1883

| No. Order |    |      |
|-----------|----|------|
| 1000      | 10 | 1.00 |
| 1001      | 10 | 1.00 |
| 1002      | 10 | 1.00 |
| 1003      | 10 | 1.00 |
| 1004      | 10 | 1.00 |
| 1005      | 10 | 1.00 |
| 1006      | 10 | 1.00 |
| 1007      | 10 | 1.00 |
| 1008      | 10 | 1.00 |
| 1009      | 10 | 1.00 |
| 1010      | 10 | 1.00 |
| 1011      | 10 | 1.00 |
| 1012      | 10 | 1.00 |
| 1013      | 10 | 1.00 |
| 1014      | 10 | 1.00 |
| 1015      | 10 | 1.00 |
| 1016      | 10 | 1.00 |
| 1017      | 10 | 1.00 |
| 1018      | 10 | 1.00 |
| 1019      | 10 | 1.00 |
| 1020      | 10 | 1.00 |
| 1021      | 10 | 1.00 |
| 1022      | 10 | 1.00 |
| 1023      | 10 | 1.00 |
| 1024      | 10 | 1.00 |
| 1025      | 10 | 1.00 |
| 1026      | 10 | 1.00 |
| 1027      | 10 | 1.00 |
| 1028      | 10 | 1.00 |
| 1029      | 10 | 1.00 |
| 1030      | 10 | 1.00 |
| 1031      | 10 | 1.00 |
| 1032      | 10 | 1.00 |
| 1033      | 10 | 1.00 |
| 1034      | 10 | 1.00 |
| 1035      | 10 | 1.00 |
| 1036      | 10 | 1.00 |
| 1037      | 10 | 1.00 |
| 1038      | 10 | 1.00 |
| 1039      | 10 | 1.00 |
| 1040      | 10 | 1.00 |
| 1041      | 10 | 1.00 |
| 1042      | 10 | 1.00 |
| 1043      | 10 | 1.00 |
| 1044      | 10 | 1.00 |
| 1045      | 10 | 1.00 |
| 1046      | 10 | 1.00 |
| 1047      | 10 | 1.00 |
| 1048      | 10 | 1.00 |
| 1049      | 10 | 1.00 |
| 1050      | 10 | 1.00 |
| 1051      | 10 | 1.00 |
| 1052      | 10 | 1.00 |
| 1053      | 10 | 1.00 |
| 1054      | 10 | 1.00 |
| 1055      | 10 | 1.00 |
| 1056      | 10 | 1.00 |
| 1057      | 10 | 1.00 |
| 1058      | 10 | 1.00 |
| 1059      | 10 | 1.00 |
| 1060      | 10 | 1.00 |
| 1061      | 10 | 1.00 |
| 1062      | 10 | 1.00 |
| 1063      | 10 | 1.00 |
| 1064      | 10 | 1.00 |
| 1065      | 10 | 1.00 |
| 1066      | 10 | 1.00 |
| 1067      | 10 | 1.00 |
| 1068      | 10 | 1.00 |
| 1069      | 10 | 1.00 |
| 1070      | 10 | 1.00 |
| 1071      | 10 | 1.00 |
| 1072      | 10 | 1.00 |
| 1073      | 10 | 1.00 |
| 1074      | 10 | 1.00 |
| 1075      | 10 | 1.00 |
| 1076      | 10 | 1.00 |
| 1077      | 10 | 1.00 |
| 1078      | 10 | 1.00 |
| 1079      | 10 | 1.00 |
| 1080      | 10 | 1.00 |
| 1081      | 10 | 1.00 |
| 1082      | 10 | 1.00 |
| 1083      | 10 | 1.00 |
| 1084      | 10 | 1.00 |
| 1085      | 10 | 1.00 |
| 1086      | 10 | 1.00 |
| 1087      | 10 | 1.00 |
| 1088      | 10 | 1.00 |
| 1089      | 10 | 1.00 |
| 1090      | 10 | 1.00 |
| 1091      | 10 | 1.00 |
| 1092      | 10 | 1.00 |
| 1093      | 10 | 1.00 |
| 1094      | 10 | 1.00 |
| 1095      | 10 | 1.00 |
| 1096      | 10 | 1.00 |
| 1097      | 10 | 1.00 |
| 1098      | 10 | 1.00 |
| 1099      | 10 | 1.00 |
| 1100      | 10 | 1.00 |

# G O L D . . O U N C E S T O D O L L A R S .

[1 ounce Troy = \$20.671834.]

| Dollars.       | Ounces. | Dollars.       | Ounces. | Dollars.       | Ounces. | Dollars.       |
|----------------|---------|----------------|---------|----------------|---------|----------------|
| 20. 671834     | 51      | 1, 054. 263534 | 100     | 2, 067. 1834   | 5, 100  | 105, 426. 3534 |
| 41. 343668     | 52      | 1, 074. 935368 | 200     | 4, 134. 3668   | 5, 200  | 107, 493. 5368 |
| 62. 015502     | 53      | 1, 095. 607202 | 300     | 6, 201. 5502   | 5, 300  | 109, 560. 7202 |
| 82. 687336     | 54      | 1, 116. 279036 | 400     | 8, 268. 7336   | 5, 400  | 111, 627. 9036 |
| 103. 359170    | 55      | 1, 136. 950870 | 500     | 10, 335. 9170  | 5, 500  | 113, 695. 0870 |
| 124. 031004    | 56      | 1, 157. 622704 | 600     | 12, 403. 1004  | 5, 600  | 115, 762. 2704 |
| 144. 702838    | 57      | 1, 178. 294538 | 700     | 14, 470. 2838  | 5, 700  | 117, 829. 4538 |
| 165. 374672    | 58      | 1, 198. 966372 | 800     | 16, 537. 4672  | 5, 800  | 119, 896. 6372 |
| 186. 046506    | 59      | 1, 219. 638206 | 900     | 18, 604. 6506  | 5, 900  | 121, 963. 8206 |
| 206. 718340    | 60      | 1, 240. 310040 | 1, 000  | 20, 671. 8340  | 6, 000  | 124, 031. 0040 |
| 227. 390174    | 61      | 1, 260. 981874 | 1, 100  | 22, 739. 0174  | 6, 100  | 126, 098. 1874 |
| 248. 062008    | 62      | 1, 281. 653708 | 1, 200  | 24, 806. 2008  | 6, 200  | 128, 165. 3708 |
| 268. 733842    | 63      | 1, 302. 325542 | 1, 300  | 26, 873. 3842  | 6, 300  | 130, 232. 5542 |
| 289. 405676    | 64      | 1, 322. 997376 | 1, 400  | 28, 940. 5676  | 6, 400  | 132, 299. 7376 |
| 310. 077510    | 65      | 1, 343. 669210 | 1, 500  | 31, 007. 7510  | 6, 500  | 134, 366. 9210 |
| 330. 749344    | 66      | 1, 364. 341044 | 1, 600  | 33, 074. 9344  | 6, 600  | 136, 434. 1044 |
| 351. 421178    | 67      | 1, 385. 012878 | 1, 700  | 35, 142. 1178  | 6, 700  | 138, 501. 2878 |
| 372. 093012    | 68      | 1, 405. 684712 | 1, 800  | 37, 209. 3012  | 6, 800  | 140, 568. 4712 |
| 392. 764846    | 69      | 1, 426. 356546 | 1, 900  | 39, 276. 4846  | 6, 900  | 142, 635. 6546 |
| 413. 436680    | 70      | 1, 447. 028380 | 2, 000  | 41, 343. 6680  | 7, 000  | 144, 702. 8380 |
| 434. 108514    | 71      | 1, 467. 700214 | 2, 100  | 43, 410. 8514  | 7, 100  | 146, 770. 0214 |
| 454. 780348    | 72      | 1, 488. 372048 | 2, 200  | 45, 478. 0348  | 7, 200  | 148, 837. 2048 |
| 475. 452182    | 73      | 1, 509. 043882 | 2, 300  | 47, 545. 2182  | 7, 300  | 150, 904. 3882 |
| 496. 124016    | 74      | 1, 529. 715716 | 2, 400  | 49, 612. 4016  | 7, 400  | 152, 971. 5716 |
| 516. 795850    | 75      | 1, 550. 387550 | 2, 500  | 51, 679. 5850  | 7, 500  | 155, 038. 7550 |
| 537. 467684    | 76      | 1, 571. 059384 | 2, 600  | 53, 746. 7684  | 7, 600  | 157, 105. 9384 |
| 558. 139518    | 77      | 1, 591. 731218 | 2, 700  | 55, 813. 9518  | 7, 700  | 159, 173. 1218 |
| 578. 811352    | 78      | 1, 612. 403052 | 2, 800  | 57, 881. 1352  | 7, 800  | 161, 240. 3052 |
| 599. 483186    | 79      | 1, 633. 074886 | 2, 900  | 59, 948. 3186  | 7, 900  | 163, 307. 4886 |
| 620. 155020    | 80      | 1, 653. 746720 | 3, 000  | 62, 015. 5020  | 8, 000  | 165, 374. 6720 |
| 640. 826854    | 81      | 1, 674. 418554 | 3, 100  | 64, 082. 6854  | 8, 100  | 167, 441. 8554 |
| 661. 498688    | 82      | 1, 695. 090388 | 3, 200  | 66, 149. 8688  | 8, 200  | 169, 509. 0388 |
| 682. 170522    | 83      | 1, 715. 762222 | 3, 300  | 68, 217. 0522  | 8, 300  | 171, 576. 2222 |
| 702. 842356    | 84      | 1, 736. 434056 | 3, 400  | 70, 284. 2356  | 8, 400  | 173, 643. 4056 |
| 723. 514190    | 85      | 1, 757. 105890 | 3, 500  | 72, 351. 4190  | 8, 500  | 175, 710. 5890 |
| 744. 186024    | 86      | 1, 777. 777724 | 3, 600  | 74, 418. 6024  | 8, 600  | 177, 777. 7724 |
| 764. 857858    | 87      | 1, 798. 449558 | 3, 700  | 76, 485. 7858  | 8, 700  | 179, 844. 9558 |
| 785. 529692    | 88      | 1, 819. 121392 | 3, 800  | 78, 552. 9692  | 8, 800  | 181, 912. 1392 |
| 806. 201526    | 89      | 1, 839. 793226 | 3, 900  | 80, 620. 1526  | 8, 900  | 183, 979. 3226 |
| 826. 873360    | 90      | 1, 860. 465060 | 4, 000  | 82, 687. 3360  | 9, 000  | 186, 046. 5060 |
| 847. 545194    | 91      | 1, 881. 136894 | 4, 100  | 84, 754. 5194  | 9, 100  | 188, 113. 6894 |
| 868. 217028    | 92      | 1, 901. 808728 | 4, 200  | 86, 821. 7028  | 9, 200  | 190, 180. 8728 |
| 888. 888862    | 93      | 1, 922. 480562 | 4, 300  | 88, 888. 8862  | 9, 300  | 192, 248. 0562 |
| 909. 560696    | 94      | 1, 943. 152396 | 4, 400  | 90, 956. 0696  | 9, 400  | 194, 315. 2396 |
| 930. 232530    | 95      | 1, 963. 824230 | 4, 500  | 93, 023. 2530  | 9, 500  | 196, 382. 4230 |
| 950. 904364    | 96      | 1, 984. 496064 | 4, 600  | 95, 090. 4364  | 9, 600  | 198, 449. 6064 |
| 971. 576198    | 97      | 2, 005. 167898 | 4, 700  | 97, 157. 6198  | 9, 700  | 200, 516. 7898 |
| 992. 248032    | 98      | 2, 025. 839732 | 4, 800  | 99, 224. 8032  | 9, 800  | 202, 583. 9732 |
| 1, 012. 919866 | 99      | 2, 046. 511566 | 4, 900  | 101, 291. 9866 | 9, 900  | 204, 651. 1566 |
| 1, 033. 591700 | 100     | 2, 067. 183400 | 5, 000  | 103, 359. 1700 | 10, 000 | 206, 718. 3400 |

. S I L V E R .  
O U N C E S T O D O L L A R S .

[1 ounce Troy = \$1.2929.]

| Ounces. | Dollars. | Ounces. | Dollars. | Ounces. | Dollars. | Ounces. | Dollars.  |
|---------|----------|---------|----------|---------|----------|---------|-----------|
| 1       | 1.2929   | 51      | 65.9379  | 100     | 129.29   | 5,100   | 6,593.79  |
| 2       | 2.5858   | 52      | 67.2308  | 200     | 258.58   | 5,200   | 6,723.08  |
| 3       | 3.8787   | 53      | 68.5237  | 300     | 387.87   | 5,300   | 6,852.37  |
| 4       | 5.1716   | 54      | 69.8166  | 400     | 517.16   | 5,400   | 6,981.66  |
| 5       | 6.4645   | 55      | 71.1095  | 500     | 646.45   | 5,500   | 7,110.95  |
| 6       | 7.7574   | 56      | 72.4024  | 600     | 775.74   | 5,600   | 7,240.24  |
| 7       | 9.0503   | 57      | 73.6953  | 700     | 905.03   | 5,700   | 7,369.53  |
| 8       | 10.3432  | 58      | 74.9882  | 800     | 1,034.32 | 5,800   | 7,498.82  |
| 9       | 11.6361  | 59      | 76.2811  | 900     | 1,163.61 | 5,900   | 7,628.11  |
| 10      | 12.9290  | 60      | 77.5740  | 1,000   | 1,292.90 | 6,000   | 7,757.40  |
| 11      | 14.2219  | 61      | 78.8669  | 1,100   | 1,422.19 | 6,100   | 7,886.69  |
| 12      | 15.5148  | 62      | 80.1598  | 1,200   | 1,551.48 | 6,200   | 8,015.98  |
| 13      | 16.8077  | 63      | 81.4527  | 1,300   | 1,680.77 | 6,300   | 8,145.27  |
| 14      | 18.1006  | 64      | 82.7456  | 1,400   | 1,810.06 | 6,400   | 8,274.56  |
| 15      | 19.3935  | 65      | 84.0385  | 1,500   | 1,939.35 | 6,500   | 8,403.85  |
| 16      | 20.6864  | 66      | 85.3314  | 1,600   | 2,068.64 | 6,600   | 8,533.14  |
| 17      | 21.9793  | 67      | 86.6243  | 1,700   | 2,197.93 | 6,700   | 8,662.43  |
| 18      | 23.2722  | 68      | 87.9172  | 1,800   | 2,327.22 | 6,800   | 8,791.72  |
| 19      | 24.5651  | 69      | 89.2101  | 1,900   | 2,456.51 | 6,900   | 8,921.01  |
| 20      | 25.8580  | 70      | 90.5030  | 2,000   | 2,585.80 | 7,000   | 9,050.30  |
| 21      | 27.1509  | 71      | 91.7959  | 2,100   | 2,715.09 | 7,100   | 9,179.59  |
| 22      | 28.4438  | 72      | 93.0888  | 2,200   | 2,844.38 | 7,200   | 9,308.88  |
| 23      | 29.7367  | 73      | 94.3817  | 2,300   | 2,973.67 | 7,300   | 9,438.17  |
| 24      | 31.0296  | 74      | 95.6746  | 2,400   | 3,102.96 | 7,400   | 9,567.46  |
| 25      | 32.3225  | 75      | 96.9675  | 2,500   | 3,232.25 | 7,500   | 9,696.75  |
| 26      | 33.6154  | 76      | 98.2604  | 2,600   | 3,361.54 | 7,600   | 9,826.04  |
| 27      | 34.9083  | 77      | 99.5533  | 2,700   | 3,490.83 | 7,700   | 9,955.33  |
| 28      | 36.2012  | 78      | 100.8462 | 2,800   | 3,620.12 | 7,800   | 10,084.62 |
| 29      | 37.4941  | 79      | 102.1391 | 2,900   | 3,749.41 | 7,900   | 10,213.91 |
| 30      | 38.7870  | 80      | 103.4320 | 3,000   | 3,878.70 | 8,000   | 10,343.20 |
| 31      | 40.0799  | 81      | 104.7249 | 3,100   | 4,007.99 | 8,100   | 10,472.49 |
| 32      | 41.3728  | 82      | 106.0178 | 3,200   | 4,137.28 | 8,200   | 10,601.78 |
| 33      | 42.6657  | 83      | 107.3107 | 3,300   | 4,266.57 | 8,300   | 10,731.07 |
| 34      | 43.9586  | 84      | 108.6036 | 3,400   | 4,395.86 | 8,400   | 10,860.36 |
| 35      | 45.2515  | 85      | 109.8965 | 3,500   | 4,525.15 | 8,500   | 10,989.65 |
| 36      | 46.5444  | 86      | 111.1894 | 3,600   | 4,654.44 | 8,600   | 11,118.94 |
| 37      | 47.8373  | 87      | 112.4823 | 3,700   | 4,783.73 | 8,700   | 11,248.23 |
| 38      | 49.1302  | 88      | 113.7752 | 3,800   | 4,913.02 | 8,800   | 11,377.52 |
| 39      | 50.4231  | 89      | 115.0681 | 3,900   | 5,042.31 | 8,900   | 11,506.81 |
| 40      | 51.7160  | 90      | 116.3610 | 4,000   | 5,171.60 | 9,000   | 11,636.10 |
| 41      | 53.0089  | 91      | 117.6539 | 4,100   | 5,300.89 | 9,100   | 11,765.39 |
| 42      | 54.3018  | 92      | 118.9468 | 4,200   | 5,430.18 | 9,200   | 11,894.68 |
| 43      | 55.5947  | 93      | 120.2397 | 4,300   | 5,559.47 | 9,300   | 12,023.97 |
| 44      | 56.8876  | 94      | 121.5326 | 4,400   | 5,688.76 | 9,400   | 12,153.26 |
| 45      | 58.1805  | 95      | 122.8255 | 4,500   | 5,818.05 | 9,500   | 12,282.55 |
| 46      | 59.4734  | 96      | 124.1184 | 4,600   | 5,947.34 | 9,600   | 12,411.84 |
| 47      | 60.7663  | 97      | 125.4113 | 4,700   | 6,076.63 | 9,700   | 12,541.13 |
| 48      | 62.0592  | 98      | 126.7042 | 4,800   | 6,205.92 | 9,800   | 12,670.42 |
| 49      | 63.3521  | 99      | 127.9971 | 4,900   | 6,335.21 | 9,900   | 12,799.71 |
| 50      | 64.6450  | 100     | 129.2900 | 5,000   | 6,464.50 | 10,000  | 12,929.00 |

# G O L D . D O L L A R S T O O U N C E S .

[1 dollar = 0.048374957925 ounce Troy.]

| Dollars. | Ounces.  | Dollars. | Ounces.  | Dollars. | Ounces.    | Dollars. | Ounces.    |
|----------|----------|----------|----------|----------|------------|----------|------------|
| 1        | 0.048375 | 51       | 2.467123 | 100      | 4.837496   | 5,100    | 246.712285 |
| 2        | 0.096750 | 52       | 2.515498 | 200      | 9.674992   | 5,200    | 251.549781 |
| 3        | 0.145125 | 53       | 2.563873 | 300      | 14.512487  | 5,300    | 256.387277 |
| 4        | 0.193500 | 54       | 2.612248 | 400      | 19.349983  | 5,400    | 261.224773 |
| 5        | 0.241875 | 55       | 2.660623 | 500      | 24.187479  | 5,500    | 266.062269 |
| 6        | 0.290250 | 56       | 2.708998 | 600      | 29.024975  | 5,600    | 270.899764 |
| 7        | 0.338625 | 57       | 2.757373 | 700      | 33.862471  | 5,700    | 275.737260 |
| 8        | 0.387000 | 58       | 2.805748 | 800      | 38.699966  | 5,800    | 280.574756 |
| 9        | 0.435375 | 59       | 2.854123 | 900      | 43.537462  | 5,900    | 285.412252 |
| 10       | 0.483750 | 60       | 2.902497 | 1,000    | 48.374958  | 6,000    | 290.249748 |
| 11       | 0.532125 | 61       | 2.950872 | 1,100    | 53.212454  | 6,100    | 295.087243 |
| 12       | 0.580499 | 62       | 2.999247 | 1,200    | 58.049950  | 6,200    | 299.924739 |
| 13       | 0.628874 | 63       | 3.047622 | 1,300    | 62.887445  | 6,300    | 304.762235 |
| 14       | 0.677249 | 64       | 3.095997 | 1,400    | 67.724941  | 6,400    | 309.599731 |
| 15       | 0.725624 | 65       | 3.144372 | 1,500    | 72.562437  | 6,500    | 314.437227 |
| 16       | 0.773999 | 66       | 3.192747 | 1,600    | 77.399933  | 6,600    | 319.274722 |
| 17       | 0.822374 | 67       | 3.241122 | 1,700    | 82.237428  | 6,700    | 324.112218 |
| 18       | 0.870749 | 68       | 3.289497 | 1,800    | 87.074924  | 6,800    | 328.949714 |
| 19       | 0.919124 | 69       | 3.337872 | 1,900    | 91.912420  | 6,900    | 333.787210 |
| 20       | 0.967499 | 70       | 3.386247 | 2,000    | 96.749916  | 7,000    | 338.624705 |
| 21       | 1.015874 | 71       | 3.434622 | 2,100    | 101.587412 | 7,100    | 343.462201 |
| 22       | 1.064249 | 72       | 3.482997 | 2,200    | 106.424907 | 7,200    | 348.299697 |
| 23       | 1.112624 | 73       | 3.531372 | 2,300    | 111.262403 | 7,300    | 353.137193 |
| 24       | 1.160999 | 74       | 3.579747 | 2,400    | 116.099899 | 7,400    | 357.974689 |
| 25       | 1.209374 | 75       | 3.628122 | 2,500    | 120.937395 | 7,500    | 362.812184 |
| 26       | 1.257749 | 76       | 3.676497 | 2,600    | 125.774891 | 7,600    | 367.649680 |
| 27       | 1.306124 | 77       | 3.724872 | 2,700    | 130.612386 | 7,700    | 372.487176 |
| 28       | 1.354499 | 78       | 3.773247 | 2,800    | 135.449882 | 7,800    | 377.324672 |
| 29       | 1.402874 | 79       | 3.821622 | 2,900    | 140.287378 | 7,900    | 382.162168 |
| 30       | 1.451249 | 80       | 3.869997 | 3,000    | 145.124874 | 8,000    | 387.000663 |
| 31       | 1.499624 | 81       | 3.918372 | 3,100    | 149.962370 | 8,100    | 391.837159 |
| 32       | 1.547999 | 82       | 3.966747 | 3,200    | 154.799865 | 8,200    | 396.674655 |
| 33       | 1.596374 | 83       | 4.015122 | 3,300    | 159.637361 | 8,300    | 401.512151 |
| 34       | 1.644749 | 84       | 4.063496 | 3,400    | 164.474857 | 8,400    | 406.349647 |
| 35       | 1.693124 | 85       | 4.111871 | 3,500    | 169.312353 | 8,500    | 411.187142 |
| 36       | 1.741498 | 86       | 4.160246 | 3,600    | 174.149849 | 8,600    | 416.024638 |
| 37       | 1.789873 | 87       | 4.208621 | 3,700    | 178.987344 | 8,700    | 420.862134 |
| 38       | 1.838248 | 88       | 4.256996 | 3,800    | 183.824840 | 8,800    | 425.699630 |
| 39       | 1.886623 | 89       | 4.305371 | 3,900    | 188.662336 | 8,900    | 430.537126 |
| 40       | 1.934998 | 90       | 4.353746 | 4,000    | 193.499832 | 9,000    | 435.374621 |
| 41       | 1.983373 | 91       | 4.402121 | 4,100    | 198.337327 | 9,100    | 440.212117 |
| 42       | 2.031748 | 92       | 4.450496 | 4,200    | 203.174823 | 9,200    | 445.049613 |
| 43       | 2.080123 | 93       | 4.498871 | 4,300    | 208.012319 | 9,300    | 449.887109 |
| 44       | 2.128498 | 94       | 4.547246 | 4,400    | 212.849815 | 9,400    | 454.724604 |
| 45       | 2.176873 | 95       | 4.595621 | 4,500    | 217.687311 | 9,500    | 459.562100 |
| 46       | 2.225248 | 96       | 4.643996 | 4,600    | 222.524806 | 9,600    | 464.399596 |
| 47       | 2.273623 | 97       | 4.692371 | 4,700    | 227.362302 | 9,700    | 469.237092 |
| 48       | 2.321998 | 98       | 4.740746 | 4,800    | 232.199798 | 9,800    | 474.074588 |
| 49       | 2.370373 | 99       | 4.789121 | 4,900    | 237.037294 | 9,900    | 478.912083 |
| 50       | 2.418748 | 100      | 4.837496 | 5,000    | 241.874790 | 10,000   | 483.749579 |

**SILVER.**  
**DOLLARS TO OUNCES.**

[1 dollar=0.773455023513 ounce Troy.]

| Dollars. | Ounces.  | Dollars. | Ounces.  | Dollars. | Ounces.     | Dollars. | O |
|----------|----------|----------|----------|----------|-------------|----------|---|
| 1        | 0.77346  | 51       | 39.44621 | 100      | 77.34550    | 5,100    | 2 |
| 2        | 1.54691  | 52       | 40.21966 | 200      | 154.69100   | 5,200    | 4 |
| 3        | 2.32037  | 53       | 40.99312 | 300      | 232.03651   | 5,300    | 4 |
| 4        | 3.09382  | 54       | 41.76657 | 400      | 309.38201   | 5,400    | 4 |
| 5        | 3.86728  | 55       | 42.54003 | 500      | 386.72751   | 5,500    | 4 |
| 6        | 4.64073  | 56       | 43.31348 | 600      | 464.07301   | 5,600    | 4 |
| 7        | 5.41419  | 57       | 44.08694 | 700      | 541.41852   | 5,700    | 4 |
| 8        | 6.18764  | 58       | 44.86039 | 800      | 618.76402   | 5,800    | 4 |
| 9        | 6.96110  | 59       | 45.63385 | 900      | 696.10952   | 5,900    | 4 |
| 10       | 7.73455  | 60       | 46.40730 | 1,000    | 773.45502   | 6,000    | 4 |
| 11       | 8.50801  | 61       | 47.18076 | 1,100    | 850.80053   | 6,100    | 4 |
| 12       | 9.28146  | 62       | 47.95421 | 1,200    | 928.14603   | 6,200    | 4 |
| 13       | 10.05492 | 63       | 48.72767 | 1,300    | 1,005.49153 | 6,300    | 4 |
| 14       | 10.82837 | 64       | 49.50112 | 1,400    | 1,082.83703 | 6,400    | 4 |
| 15       | 11.60183 | 65       | 50.27458 | 1,500    | 1,160.18254 | 6,500    | 5 |
| 16       | 12.37528 | 66       | 51.04803 | 1,600    | 1,237.52804 | 6,600    | 5 |
| 17       | 13.14874 | 67       | 51.82149 | 1,700    | 1,314.87354 | 6,700    | 5 |
| 18       | 13.92219 | 68       | 52.59494 | 1,800    | 1,392.21904 | 6,800    | 5 |
| 19       | 14.69565 | 69       | 53.36840 | 1,900    | 1,469.56454 | 6,900    | 5 |
| 20       | 15.46910 | 70       | 54.14185 | 2,000    | 1,546.91005 | 7,000    | 5 |
| 21       | 16.24256 | 71       | 54.91531 | 2,100    | 1,624.25555 | 7,100    | 5 |
| 22       | 17.01601 | 72       | 55.68876 | 2,200    | 1,701.60105 | 7,200    | 5 |
| 23       | 17.78947 | 73       | 56.46222 | 2,300    | 1,778.94655 | 7,300    | 5 |
| 24       | 18.56292 | 74       | 57.23567 | 2,400    | 1,856.29206 | 7,400    | 5 |
| 25       | 19.33638 | 75       | 58.00913 | 2,500    | 1,933.63756 | 7,500    | 5 |
| 26       | 20.10983 | 76       | 58.78258 | 2,600    | 2,010.98306 | 7,600    | 5 |
| 27       | 20.88329 | 77       | 59.55604 | 2,700    | 2,088.32856 | 7,700    | 5 |
| 28       | 21.65674 | 78       | 60.32949 | 2,800    | 2,165.67407 | 7,800    | 6 |
| 29       | 22.43020 | 79       | 61.10295 | 2,900    | 2,243.01957 | 7,900    | 6 |
| 30       | 23.20365 | 80       | 61.87640 | 3,000    | 2,320.36507 | 8,000    | 6 |
| 31       | 23.97711 | 81       | 62.64986 | 3,100    | 2,397.71057 | 8,100    | 6 |
| 32       | 24.75056 | 82       | 63.42331 | 3,200    | 2,475.05608 | 8,200    | 6 |
| 33       | 25.52402 | 83       | 64.19677 | 3,300    | 2,552.40158 | 8,300    | 6 |
| 34       | 26.29747 | 84       | 64.97022 | 3,400    | 2,629.74708 | 8,400    | 6 |
| 35       | 27.07093 | 85       | 65.74368 | 3,500    | 2,707.09258 | 8,500    | 6 |
| 36       | 27.84438 | 86       | 66.51713 | 3,600    | 2,784.43808 | 8,600    | 6 |
| 37       | 28.61784 | 87       | 67.29059 | 3,700    | 2,861.78359 | 8,700    | 6 |
| 38       | 29.39129 | 88       | 68.06404 | 3,800    | 2,939.12909 | 8,800    | 6 |
| 39       | 30.16475 | 89       | 68.83750 | 3,900    | 3,016.47459 | 8,900    | 6 |
| 40       | 30.93820 | 90       | 69.61095 | 4,000    | 3,093.82009 | 9,000    | 6 |
| 41       | 31.71166 | 91       | 70.38441 | 4,100    | 3,171.16560 | 9,100    | 7 |
| 42       | 32.48511 | 92       | 71.15786 | 4,200    | 3,248.51110 | 9,200    | 7 |
| 43       | 33.25857 | 93       | 71.93132 | 4,300    | 3,325.85660 | 9,300    | 7 |
| 44       | 34.03202 | 94       | 72.70477 | 4,400    | 3,403.20210 | 9,400    | 7 |
| 45       | 34.80548 | 95       | 73.47823 | 4,500    | 3,480.54761 | 9,500    | 7 |
| 46       | 35.57893 | 96       | 74.25168 | 4,600    | 3,557.89311 | 9,600    | 7 |
| 47       | 36.35239 | 97       | 75.02514 | 4,700    | 3,635.23861 | 9,700    | 7 |
| 48       | 37.12584 | 98       | 75.79859 | 4,800    | 3,712.58411 | 9,800    | 7 |
| 49       | 37.89930 | 99       | 76.57205 | 4,900    | 3,789.92962 | 9,900    | 7 |
| 50       | 38.67275 | 100      | 77.34550 | 5,000    | 3,867.27512 | 10,000   | 7 |

## ADVERTISEMENT.

The publications of the United States Geological Survey are issued in accordance with the statute, approved March 3, 1879, which declares that—

"The publications of the Geological Survey shall consist of the annual report of operations, geological and economic maps illustrating the resources and classifications of the lands, and reports upon general and economic geology and paleontology. The annual report of operations of the Geological Survey shall accompany the annual report of the Secretary of the Interior. All special memoirs and reports of said Survey shall be issued in uniform quarto series if deemed necessary by the Director, but otherwise in ordinary octavos. Three thousand copies of each shall be published for scientific exchanges and for sale at the price of publication; and all literary and cartographic materials received in exchange shall be the property of the United States and form a part of the library of the organization. And the money resulting from the sale of such publications shall be covered into the Treasury of the United States."

### ANNUAL REPORTS.

From the above it will be seen that only the Annual Reports, which form parts of the reports of the Secretary of the Interior and are printed as executive documents, are available for gratuitous distribution. A number of these are furnished the Survey for its exchange list, but the bulk of them are supplied directly, through the document rooms of Congress, to members of the Senate and House. Except, therefore, in those cases in which an extra number is supplied to this Office by special resolution, application must be made to members of Congress for the Annual Reports, as for all other executive documents.

Of these Annuals there have been already published:

I. First Annual Report to the Hon. Carl Schurz, by Clarence King. Washington, 1880. 8°. 79 pp. 1 map.—A preliminary report describing plan of organization and publications.

II. Report of the Director of the United States Geological Survey for 1880-'81, by J. W. Powell. Washington, 1882. 8°. lv, 588 pp. 61 pl. 1 map.

III. Third Annual Report of the United States Geological Survey, 1881-'82, by J. W. Powell. Washington, 1883. 8°. xviii, 564 pp. 67 pl. and maps.

IV. Fourth Annual Report of the United States Geological Survey, 1882-'83, by J. W. Powell. Washington, 1884. 8°. xii, 473 pp. 85 pl. and maps.

### MONOGRAPHS.

The Monographs of the Survey are printed for the Survey alone, and can be distributed by it only through a fair exchange for books needed in its library, or through the sale of those copies over and above the number needed for such exchange. They are not for gratuitous distribution.

So far as already determined upon, the list of these Monographs is as follows:

I. The Precious Metals, by Clarence King. In preparation.

II. Tertiary History of the Grand Cañon District, with atlas, by Capt. C. E. Dutton. Published.

III. Geology of the Comstock Lode and Washoe District, with atlas, by George F. Becker. Published.

IV. Comstock Mining and Miners, by Elliot Lord. In press.

V. Copper-bearing Rocks of Lake Superior, by Prof. R. D. Irving. In press.

VI. Older Mesozoic Flora of Virginia, by Prof. William M. Fontaine. In press.

VII. Silver-lead Deposits of Eureka, Nevada, by Joseph Story Curtis. In press.

VIII. Paleontology of Eureka District, Nevada, by Charles Doolittle Walcott. In press.

Geology and Mining Industry of Leadville, with atlas, by S. F. Emmons. In preparation.

Geology of the Eureka Mining District, Nevada, with atlas, by Arnold Hague. In preparation.

Coal in the United States, by Prof. R. Pumpelly. In preparation.

Iron of the United States, by Prof. R. Pumpelly. In preparation.

Lesser Metals and General Mining Resources, by Prof. R. Pumpelly. In preparation.

Lake Bonneville, by G. K. Gilbert. In preparation.

Dinocerata. A monograph on an extinct order of Ungulates, by Prof. O. C. Marsh. In press.

Sauropoda, by Prof. O. C. Marsh. In preparation.

Stegosauria, by Prof. O. C. Marsh. In preparation.

Of these Monographs, Nos. II and III are now published, viz:

Bull. No. 3.



## ADVERTISEMENT.

II. Tertiary History of the Grand Cañon District, with atlas, by C. E. Dutton, Capt. U. S. A. 1882. 4°. 264 pp. 42 pl. and atlas of 26 double sheets folio. Price \$10.12.

III. Geology of the Comstock Lode and Washoe District, with atlas, by George F. Becker. 1882. 4°. 422 pp. 7 pl. and atlas of 21 sheets folio. Price \$11.

No. IV, V, VI, VII, and VIII are in press and will appear in quick succession. The others, to which numbers are not assigned, are in preparation.

## BULLETINS.

The Bulletins of the Survey will contain such papers relating to the general purpose of its work as do not come properly under the heads of ANNUAL REPORTS or MONOGRAPHS.

Each of these Bulletins will contain but one paper, and be complete in itself. They will, however, be numbered in a continuous series, and will in time be united into volumes of convenient size. To facilitate this, each Bulletin will have two paginations, one proper to itself and another which belongs to it as part of the volume.

Of this series of Bulletins, Nos. 1, 2, and 3 are already published, viz:

1. On Hypersthene-Andesite and on Triclinic Pyroxene in Augite Rocks, by Whitman Cross, with a Geological Sketch of Buffalo Peaks, Colorado, by S. F. Emmons. 1883. 8°. 40 pp. 2 pl. Price 10 cents.

2. Gold and Silver Conversion Tables, giving the coining value of Troy ounces of fine metal, &c., by Albert Williams, jr. 1883. 8°. ii, 8 pp. Price 5 cents.

3. On the Fossil Faunas of the Upper Devonian along the meridian of 76° 30', from Tompkins Co., N. Y., to Bradford Co., Pa., by Henry S. Williams. 1884. 8°. 36 pp. Price 5 cents.

## STATISTICAL PAPERS.

A fourth series of publications having special reference to the mineral resources of the United States is contemplated; of that series the first has been published, viz: Mineral Resources of the United States, by Albert Williams, jr. 1883. 8°. xvii, 513 pp. Price 50 cents.

Correspondence relating to the publications of the Survey, and all remittances, which must be by postal note or money order, should be addressed to the

DIRECTOR OF THE UNITED STATES GEOLOGICAL SURVEY,  
Washington, D. C.

WASHINGTON, D. C., May 1, 1884.

DEPARTMENT OF THE INTERIOR

---

BULLETIN

OF THE

UNITED STATES

GEOLOGICAL SURVEY

No. 3



WASHINGTON  
GOVERNMENT PRINTING OFFICE  
1884



UNITED STATES GEOLOGICAL SURVEY  
J. W. POWELL DIRECTOR

---

ON  
THE FOSSIL FAUNAS  
OF THE  
UPPER DEVONIAN

ALONG THE MERIDIAN OF 76° 30' FROM TOMPKINS COUNTY, N. Y.,  
TO BRADFORD COUNTY, PA.

BY

HENRY S. WILLIAMS



WASHINGTON  
GOVERNMENT PRINTING OFFICE  
1884



# ON THE FOSSIL FAUNAS OF THE UPPER DEVONIAN.

By HENRY S. WILLIAMS.

The precise order with which geological faunas have made their appearance and succeeded one another is little enough understood for any long period of time, but for no period of geological history is there greater perplexity in regard to this order, in proportion to the knowledge we have of the species themselves, than for that filling the interval between the Upper Silurian and the Coal Measures of the Carboniferous.

This perplexity exists, not only for the American series, but in Great Britain—in Europe—wherever large areas have been geologically surveyed there are problems in regard to the relations of these faunas still unsolved.

In America the sections of the Devonian and the Sub-Carboniferous deposits are alike in no two States. In one section the changes in stratigraphical conditions are accompanied by well-marked faunas; in another, the species making up the faunas appear under different combinations, and species characteristic of distinct zones in one series will be found mingled in a common fauna of another.

That there is some explanation of these differences, some clew to this apparent confusion, is certainly to be presumed.

As the questions involved concern the laws of range and distribution of organisms, and thus are based upon the effects of changed or changing conditions of environment upon the organisms, we naturally look to the zoology of living forms for suggestions.

We find that in the present ocean the depth of water, the temperature, and the degree of saltness and the freedom from suspended impurities have all a marked influence upon the normal fauna of every part of the ocean.

Further, we find that on the two sides of the ocean—on opposite coasts of a continent—and even along a continuous coast-line, in two regions separated by a few degrees latitude, the faunas are characteristically different, and when these geographical areas are far separated, although under similar conditions otherwise, the faunas may contain scarcely a single species in common.

The revelations made by deep-sea dredging are also very suggestive. They have shown us that with all these differences in upper faunas, in the depths of the ocean species may range from one quarter of the

globe to the opposite quarter with scarcely a varietal modification, and when the physical conditions have been continuous, geological ages are not too long for the perpetuation of species without important modification.

Again, the wonderful effects upon the distribution of faunas produced by ocean currents is brought forcibly to our attention by the reports of our Fish Commission. Their investigations reveal the existence of an abundant fauna within a hundred miles of the New England coast, entirely distinct from the fauna prevailing all along that part of the coast out to deep water; and further, as Professor Verrill informs me, this unique fauna, which, at the time of its first discovery was composed of a large number of species and a great abundance of individuals, has now apparently left the region altogether.

From this we learn that in a very small geographical area we might find the remains of two entirely distinct faunas, preserved in two strata of a continuous formation, lying the one immediately upon the other, conformably, yet geologically entirely contemporaneous.

In the light of such facts the study of fossil faunas becomes an extremely complex problem.

The aggregation of species into faunas, the blending of one fauna with another, the rarity or abundance of particular species, variation in form or size or modification of specific characters, the extinction of old and the initiation of new forms—all these become the most delicate tests of change in the physical conditions, the record of which constitute the geological history of the earth.

For the correct solution of this problem the laws of geographical distribution form as important an element as geological sequence. The attempt to apply such principles to the study of the Devonian and Sub-Carboniferous deposits is no simple task, but the very fact that their faunas offer so great variation and difference in their combinations makes this series particularly attractive for the purpose.

In the eastern half of America are a dozen or so States in which more or less complete sections of the deposits, from the Niagara group to the Coal Measures, may be studied.

While our State surveys have been accurate and thorough for economical purposes, those engaged in the work have generally been satisfied with noting and describing the fossil species found in each geological formation, rarely are the complete faunas of any locality or stratum given in detail.

From our present literature it is difficult to ascertain anything beyond the general facts of the geographical distribution of fossil species; and the study of geological range is complicated by the uncertainties as to the precise equivalency of the deposits containing the fossils.

This study involves, therefore, not only an arduous review of the geological surveys of the several regions of the country, but requires

also a special preparation of long sections covering the whole series of deposits under consideration, and at such geographical intervals as will allow of the certain determination of stratigraphical equivalency between them.

In making such sections, it is important to note the exact order of the faunas and the abundance, rarity, difference in relative size, and any modification of form of the species contained in the fauna, together with the particular lithological character of the rock.

It was with such ideas in mind that I examined in the summer of 1882 a meridional section extending from Cayuga Lake southward to the first appearance of coal at the Barclay mine, in Southern Bradford County, Pennsylvania. This section, added to the well-known section exposed along the shores of Cayuga Lake, gives us a continuous series from the base of the Devonian to the coal lying above the first conglomerate of this meridian. I gave particular attention to the faunas marking the passage from the second Devonian Black Shale (the Genesee shale) through the "Portage," "Ithaca," and Chemung groups.

The precise thickness of the whole series must remain a matter of calculation. The numerous local sections were measured and may be put together, but the element of dip is not uniform, and can be reached only approximately.

The details of the stratigraphical characters constantly change, so that the sections of two ravines, within a few miles of each other, are quite different. Still, the general character of the rock masses and the prominent composition of the faunas are easily followed from one exposure to the next throughout the whole area examined.

The sequence of the faunas, which was particularly sought, was satisfactorily determined. I do not believe that the complete fauna of any particular zone has been given; but in the lists which follow all the characteristic species are undoubtedly included, and all the species thus far discovered in condition admitting of identification are also recorded.

It must be remembered that a great majority of the fossils of these Upper Devonian shales are in the condition of impressions, often very perfect, but many of them fragmentary. The section here examined lies between the third and fourth districts of the original State survey (see Vanuxem's *Geol. of N. Y.*, 3d Dist., 1842, p. 170), and both Professor Hall, who reported on the fourth district, and Mr. Vanuxem, who reported on the third, regarded it as a typical section, though in no report are we able to find a satisfactory description of it.

The present condition of the rocks presents a series of gentle undulations, with a general slight dip to the south (see *Proc. Am. Ass. Adv. Sc.*, Vol. XXXI., Pt. 2, p. 412); a continuation northward of the condition of things described in Report G, Second Geol. Surv. of Penn., p. 9, &c.



The average dip as estimated for this section is something over 25 feet per mile.

North of Ithaca, at Burdick's Glen, 4 miles from the southeast corner of Cayuga Lake, the Genesee shale appears capped by the sandstones and shales of the Portage group. At that point the top of the Genesee shale is about 60 feet above the lake level, or (376+60) approximately 440 feet above the sea level.

The fauna of this Black Shale contains, as was suggested by Professor Hall in his early study of these formations, several species of the fauna appearing in the Marcellus Black Shales which overlie the Corniferous limestone.

A comparative study of these and other faunas led me to infer that the Genesee fauna was merely a recurrence of the Marcellus fauna, a few species dropping out and a few being added, and that the same fauna did not become extinct with the incursion of sands and shales of the Portage group, but with some modifications continued to appear under favorable conditions after the Portage faunas were initiated. (See Recurrence of Faunas, Proc. Am. Ass. Adv. Sc., Vol. XXX, p. 186.) Evidence is also found of the recurrence of a partial Hamilton fauna just before the incursion of the fauna of the "Ithaca group" of Vanuxem.

These facts made it plain that over any particular area the faunas shifted back and forth with the advance of geological time. Hence I was led to the simple conception of a fauna as continuing on intact so long as the favorable conditions for its life continued, as shifting its habitat with the elevation or depression of the land with the advance or retrocession of the coast line. In such shifting and change of condition, one species after another may drop out and become extinct; others may suffer varietal modification, and, what is still more important, the sudden appearance of new forms may take place in the midst of the normal fauna—forms new to the locality only, or entirely new, so far as our knowledge of the fossils can tell us. Merely from the initiation of the new forms in the fauna we can gain no clew of its origin, but the study of its relations to allied forms of other faunas may enable us to decide whether it is a modification of some older form, or the forerunner of a new type, marking a later geological stage.

Thus our attention is called to the study of the typical forms of organisms with their variations—to associate their variable elements with locality or geological horizon, and thus to accumulate the elements for an historical account of organisms.

As we enter this field of investigation we soon find that specific names in palæontology have often been given under the influence of the belief in the old canon that each geological formation had its distinct set of organisms. Hence, when the boundary between two such divisions of the rocks is once established, the tendency has been strong to give separate specific names to representatives of the two formations,

and to define as specific the differences, which often prove to be little more than individual variations. It is therefore necessary to guard against deception caused by specific names.

In tracing the species of a single section backwards or forwards, we find at each stage a particular facies to the fauna, which suggests its nearest relation, and for this purpose varietal characters are especially valuable. For instance, in the Ithaca group the *Spirifera mesocostalis*, of the type "*prolata*" of Vanuxem or *D. acuminata* of Hall, is characteristic of the lower stage, while the higher, and particularly the Western New York variety, is Hall's typical *Sp. mesocostalis*. In the higher beds the two occur together, but the latter prevail; in the lower beds we never see the later variety. The varietal modification of the species then becomes a mark of the horizon. Many such cases might be mentioned, and the mere record of the species is not sufficient—the specimens should be examined in every case.

We have in the present section several clearly defined faunas of which I propose to give some account in this paper.

At the base of the Upper Devonian is the second appearance of the Devonian Black Shale. The limestone which underlies it is the Tully limestone. West of the Cincinnati axis there appears to be only a single mass of this Black Shale, and even in Ohio the separation of the Black Shales is not entire except in the eastern part, and there no limestone bed intervenes.

That these Black Shales were in some way associated with an elevation of the sea-bottom seems conclusive, from the relation they bear to limestone deposits below, and from the nature of the fauna and flora contained. Thus the Utica slates follow the Trenton limestone, the Marcellus the Corniferous limestone, the Genesee the Tully limestone, or where the Tully was wanting, the Hamilton itself is more or less calcareous.

The shales are mostly barren of marine fossils, and only rarely are distinct pieces of plant stems seen.

*Lepidodendra* and *Rhodesa* are occasionally found.

The fauna is usually found near the top, and all the species are delicate and mostly minute or small.

The species detected in this locality are as follows :

FAUNA OF No. 34 D., GENESEE SHALE.

- Discina lodensis.*
- truncata.*
- Lingula spatulata.*
- concentrica.*
- Styliola fissurella.*
- Tentaculites gracilistriatus.*
- Orthoceras subulatum.*
- Leiorhynchus quadricostatus.*

*Lunulacardium fragile.*

*Cardiola speciosa.*

*Ambocœlia umbonata.*

*Chonetes lepida.*

*Goniatites* (a fragment).

*Rhodea pinnata* (stems).

*Phthonia lirata.*

The more abundant species are:

*Discina lodensis.*

*Styliola fissurella.*

*Chonetes lepida.*

The variety of *D. lodensis*, called by Hall *D. truncata*, is quite common. Comparison of numerous specimens leads me to believe that this is but a varietal modification of *D. lodensis*.

The rest of the species are rare.

Immediately above the Genesee shale are two thick sandstone layers separated by a few inches of shale, the whole about 4 feet thick.

In these sands and shales there are great numbers of pyrite nodules from the size of a pea, or smaller, to an inch and over in length. No fossils were observed in these first beds.

Following the sandstone are the sandy shales, characteristic of the Portage group.

Above the sandstone there occur some masses of black fissile shale resembling the Genesee shale, but neither so dark nor so soft. The silica predominates and the fauna is sparse, and, so far as observed, never bears the *Discina* or *Lingula* of the beds below.

Some lighter-colored, greenish, soft shales appear above, and in them occurs the first distinct Portage fauna.

The first species seen are *Cardiidae*—the large forms, originally described as *Pinnopsis ornatum* and *P. acutirostra*—and on passing upward we soon meet *Cardiola speciosa*, *Goniatites*, *Hyolithes*, and *Coleolus*, and after passing fifty or a hundred feet of blue-gray, sandy shales, with some light olive argillaceous shale, and an occasional dark streak, the *Nuculas* and *Lunulacardium fragile* appear.

The passage is gradual from the lower to the upper of these subfaunas, and there is no distinct stratigraphical division of the series until we pass the brachiopod fauna, which is unique in holding *Spirifera lævis* in abundance. This fauna occurs about 200 feet above the base of the Portage formation in this meridian. About 50 feet below it, or say 150 feet above the Genesee shale, is a sparse but very interesting fauna, characterized by the abundance of a large *Oladochonus* (McCoy), a genus closely allied to *Aulopora*, of an undescribed species, which I have figured and described in MSS.

This is the first fauna which is distinct from the general Portage fauna with which it is interstratified. The fauna is that of Station No. 48 of my

records, and occurs in a dark, blue-gray shale, weathering brown, less arenaceous than the ordinary Portage shales, and outcropping along the side of Cayuga Lake Railroad, a little north of McKinney's Station.

## FAUNA OF No. 48.

*Cladochonus* (McCoy), sp.  
*Spirifera subumbona*, Hall.  
*Chonetes lepida*.  
*Leiorhynchus mesocostalis*.  
*Grammysia subarcuata*.  
*Cardiola speciosa*.  
*Goniatites complanatus* ?  
 ? *Leda curta*.  
*Palæoneilo filosa* ?  
*Nucula Randalli* (or ? new).  
*Nuculites oblongatus*.  
*Strophodonta mucronata*.  
*Coleolus aciculum*.  
*Orthoceras* = a small form (= ? *O. bebryx*).  
 Arm of a small crinoid.  
 Stem of *Rhodea*.  
 A small Lamellibranch (= ? *Macrodon*).

This fauna (of Station No. 48), coming as it does entirely below the *Spirifera lævis* fauna, is remarkable as holding several species which are generally regarded as characteristic Chemung species.

The *Strophodonta mucronata* is particularly to be noted, but the entire facies of the fauna reminds us of the Ithaca group rather than anything below. The *Spirifera subumbona*, Hall, is well preserved, and exhibits the convex dorsal valve and the surface-markings of that species. That this is identical with the forms occurring in the higher Chemung faunas and called *Ambocælia umbonata* var. *gregaria* of Hall, I have no doubt. It is also possible that the British and European *Spirifera urti*, Fleming, is specifically identical. This form is a characteristic of the Upper Devonian faunas, where it is generally associated with our representatives of "*Spirifera disjuncta* and *Orthis interlineata*," the species mentioned by Murchison as its common associates in the Barnstaple, Marwood, and Pilton series of North Devon. Its surface-markings, which are quite like those of *Spirifera lævis* (occurring just above it and but once elsewhere in the series for this meridian) lead us to associate it with the early representatives of the Carboniferous faunas.

*Cladochonus* is also, so far as recorded, a Carboniferous form. (See Murchison's *Siluria*, 2d ed., p. 299; Davidson's *Brachiopoda*, Pt. VI, p. 41; Hall, *Geol. N. Y.*, 4th Dist., pp. 234, 261.)

The species collected from station 48, are all small and delicate, and some of them are mere fragments.

The *Oladochonus* and the *Spirifers* are the most abundant, and show the result of favorable conditions for growth.

The species, both below and above this stratum, are rare and generally fragile, and consist of pelagic forms, such as *Pteropods* and *Cephalopods* with a characteristic fauna of *Lamellibranchiates*, but scarcely a trace of *Brachiopods*.

The next distinct fauna we recognize is that of Stations No. 1 and No. 4, two points on opposite sides of the valley in which Ithaca is situated.

Station No. 1 is at the foot of Fall Creek on the east side, and No. 4 is at the southwest corner of Cayuga Lake. A few other exposures of the same horizon have been examined, but these two are characteristic.

The prominent species of this fauna are—

*Spirifera laevis*, Hall, and *Palæoneilo filosa*, Con.

*Lunulacardium fragile* is generally present but not abundant, and *Taxocrinus Ithacensis* is represented quite abundantly by fragments of the stem and by an occasional perfect head.

The other species named are representative of the fauna but are less frequently obtained.

In this list, as in others which follow, some species are recorded from fragmentary specimens from which only the generic characters can be determined with satisfaction.

#### FAUNA OF STATION No. 1, B AND D.\*

*Spirifera laevis*.

*Palæoneilo filosa*.

*Lunulacardium fragile*.

*Chonetes lepida*.

*Taxocrinus Ithacensis*.

*Goniatites complanatus* var. *perlatus*.

*sinuosus*.

*discoideus*.

*Porcellia Nais*.

*Orthoceras pecator*.

*anguis*.

*Coleoprion* sp.

*Cardiola speciosa*.

*Styliola fissurella*.

*Hyalithes aclis*.

*Aviculopecten* sp.

*Cyrtina Hamiltonensis*.

*Grammysia subarcuata*.

*Modiomorpha subalata*.

? *Aulopora* or *Oladochonus*, fragments.

*Palæoneilo constricta*.

---

\* The species recorded in these lists are arranged in the order of their relative abundance at each station, the more common being placed first.

*Cardiola transversa?*  
*Leda perstriata.*  
*Pleurotomaria* sp.  
*Discina* sp.  
*Leiorhynchus mesocostalis.*  
*Crania* sp.  
*"Lycopodites" Vanuxemi.*  
*Leperditia.*  
*Rhodea* stems.  
 Fish bones, fragments.  
*Stictopora Meeki.*

Some other species are recorded from the "Portage" at Ithaca, and may belong to this fauna, but the list here given includes only species known to belong to this particular horizon.

As far as known this fauna does not occur west of Seneca Lake, and, taken as a whole, it is characteristic of the eastern extension of the Portage group. I would call particular attention to the absence of *Præcardium* (*Cardium*?) *tetusta* and *Cardiomorpha* ("*Ungulina*") *suborbicularis*. I have not observed either of these species in any part of the present meridional section, although they are frequently met with in the Portage formation a little farther west.

Three of the species will be remembered as common in the higher Chemung faunas (*Cyrtina Hamiltonensis*, *Grammysia subarcuata*, and *Modiomorpha subalata*), but they occur also below in the Hamilton group, or are represented by a closely allied form, as *Grammysia arcuata*.

*Spirifera lævis* is a specially interesting form. It appears to be quite limited both in range and distribution. A closely allied form, *Sp. maia*, occurs in the lower Devonian of Ohio and Ontario, and a similar form appears in the Devonian of the far West. It is closely allied, if not identical, with *Spirifera glabra* of the British Carboniferous, and appears to link that species with the Devonian *Sp. curvata*. (See Davidson, Supl. Brit. Dev. Brachiopoda, p. 32.)

Tracing the faunas upward, after passing the *Spirifera lævis* stage, the shales gradually lose their coarse bedded character, the laminae become finer and more fissile, and about 30 feet higher up the rocks assume a decided fissile character—are composed of a dark, nearly black, shale, weathering reddish-brown from iron stain, and occasionally carry lenticular beds of very tough, siliceous sandstone. These sandstone masses I have described elsewhere as channel-fillings. (See Am. Jour. Sc., Vol. XXI, p. 318.)

The dark, fissile, argillaceous shales are generally about 20 feet thick; no fossils appear at their base, but toward the top are often found great numbers of *Lingulas* and a few other delicate species.

The famous *Lycopodites* beds of Professor Hall lie in these shales, where great numbers of *L. Vanuxemi* in very perfect condition occur, with stems of *Rhodea* and other plants, and large fish-bones.

Numerous exposures of this stage are seen in the ravines about Ithaca. My Station No. 6 gives a good exhibition of the fauna. In the following list the species named are from Station No. 6 and equivalent strata within a radius of a mile or so about it:

FAUNA OF STATION No. 6.

*Lingula complanata.*  
*Ptilophyton (Lycopodites) Vanuxemi.*  
*Leiorhynchus mesocostalis* and vars.  
*Lunulacardium fragile.*  
*Cardiola speciosa* (rare).  
*Lingula punctata.*  
     *spatulata* var.  
     *ligea.*  
*Poteriocrinus*, stems.  
*Productella*, a minute species.  
*Styliola fissurella.*  
*Rhodea* stems.  
 † *Spirorbis.*  
*Rhachiopteris punctata.*  
 † *Psilophyton.*  
*Productella truncata.*  
*Palæoneilo filosa.*  
     *brevis.*  
*Leptodesma* sp.  
*Goniatites complanatus.*  
*Microdon gregaria.*  
*Orthoceras pectorator.*  
*Loxonema* sp.  
*Rhynchonella eximia* (young).  
*Pleurotomaria capillaria.*  
*Phthonia lirata.*

In this fauna *Lingula complanata* and *Lunulacardium fragile* are the characteristic species, and are generally abundant.

The *Ptilophyton* Dawson=*Lycopodites* is abundant in some localities, and the *Leiorhynchus* is also very abundant in some layers, but does not appear in all the exposures. The other species are rare; some of them are known only by fragments.

The *Leiorhynchus* is very variable, and is a thin, fragile shell in these shales, and often distorted.

Specimens occur which present more or less fully the distinctive characters of *L. limitaris*, of *L. quadricostata*, or of *L. mesocostalis*.

A comparative study of the specimens from various stages of the Devonian has led me to regard all the species of *Leiorhynchus*, of the New York Devonian at least, as varieties of a common form, whose plasticity has not permanently ceased at any of the horizons in which it

occurs. The different varieties appear to be closely related to the nature of the rock containing them; but, while the majority of individuals in any particular stratum are of one variety, in most every case some individuals present the characteristics of the other varieties.

*Lingula complanata* is of the type of the Ohio species, *L. membranacea* and *L. manni*; and the Brazilian species, *L. stauntoniana*, Rathbone, 1874, is indistinguishable from some specimens of *L. complanata*, and also occurs in a dark fissile shale.

This form is entirely distinct from the *L. ligea* and *L. ligea* var. of Hall, in so far as description and illustration go, but it appears to have been included among the typical specimens now in the American Museum.

A couple of specimens, agreeing entirely with the figures and descriptions of the *L. ligea* H, in the New York reports, have been found in these beds associated with the others; but the thin, almost perfectly flat character of *L. complanata* is characteristic of it, as seen in many hundred specimens. The theory that the latter is but a crushed *L. ligea* is contradicted by the observation that the flattening of an oval convex form, like *L. ligea* would increase the width near the center where the shell is most convex, while near the front the width would be little changed, so the sides would be even more curved, instead of being nearly straight as in the form called *L. complanata*.

As we pass above this soft shale, which is generally terminated by a 6 to 8 inch stratum of sandstone, the fauna changes.

A layer of concretions, like cobble-stones, occurs a few feet above the sandstone; this is followed by a thin stratum of arenaceous shale, with an abundance of *Lingula punctata*.

A few feet higher occurs my fauna No. 14 N—a remarkable recurrent Hamilton fauna, traces of which have been seen in several localities.

The species identified are as follows:

#### FAUNA OF STATION No. 14 N.

*Spirifera fimbriata.*  
*angusta.*  
*Pleurotomaria capillaria.*  
*Ambocælia umbonata.*  
*Loxonema delphicola.*  
*Leiorhynchus mesocostalis.*  
*Rhynchonella contracta.*  
*Orthoceras* sp.  
*Avicula subdecussata.*  
*Microdon tenuistriata?*  
*Modiomorpha complanata.*  
*Palæonsilo* sp.  
*Lingula punctata.*  
*L.* sp.



The shales above Station No. 14 N become coarse and blocky, and so continue for hundreds of feet, interrupted by occasional thin beds of soft argillaceous shale and layers of hard sand.

The fauna characteristic of the "Ithaca group," of the early New York reports, begins to appear at this point, with *Leiorrhynchus* the first genus to be abundantly represented.

The form *L. mesocostalis* is more common in the soft shales, but in the more arenaceous beds the convex forms *L. globuliformis* and *L. Kelloggi* appear; but here, as in lower stages, the presence or absence of lateral plications, the number of folds on the sinus, or its prominence, and the general form of the shell are characters which vary in almost every handful of specimens, and lead us to believe that the representatives of the genus *Leiorhynchus*, found in the Devonian of New York at least, offer no better claim to specific distinction than do the various forms of *Atrypa reticularis*, although the variations of form and the relative prevalence of certain variations are valuable and, we believe, sensitive indicators of changed conditions of the environment.

There is a general rule which prevails among the forms called *Leiorhynchus*. In the early stages of the Devonian—the Marcellus shale or below—the majority of specimens are plicated over the sinus and way to the lateral margin of the shell, giving us typical *L. limitaris*, but even in the Marcellus, individuals, especially as they increase in size, drop the lateral plications. The prevailing type for the Hamilton is that called *L. multicoستا*, in which the lateral plications are generally faint and fewer, while the central plications are strong and more raised than in the lower forms. In the Genesee, *L. quadricostata* is the common form, with the lateral folds nearly obliterated.

In the early Chemung, *L. mesocostalis*, *globuliformis*, and forms like *L. Kelloggi* prevail, while the small *L. sinuatus* is more common toward the top, all of them, typically, having smooth lateral slopes and a few plications along the center, forming a more or less distinct fold and sinus.

But we notice that a few specimens may be found in Chemung shales, plicated quite to the margin, as in the early type. Thus in interpreting the fauna of 14 N., the presence of the Chemung type of *Leiorhynchus*, although in the midst of a nearly pure Hamilton fauna, shows that, in time, we have passed the Hamilton stage, though Hamilton species are not yet extinct, and that we have a recurrent fauna, and not the normal Hamilton fauna. Thus the fossils independently confirm the facts which the stratigraphy testifies.

Passing this transition stage in which an occasional fossil appears—a *Palæoneilo*, a *Leiorhynchus*, or some other species of wide range—the fauna of the Ithaca group gradually makes its appearance. Between 150 and 200 feet above the *Lingula complanata* stage the Ithaca fauna appears in full force, and 50 feet higher has exhibited the full complement of its species.

The first species, which is thoroughly characteristic of the fauna, is

*Spirifera mesocostalis* of the eastern variety. This is the form figured in Pal. N. Y., Vol. IV, Plate 40, Figs. 1, 2, and 3. At the first appearance of this species, it is associated with *Leiorhynchus mesocostalis*, *Palæoneilo filosa*, and *Chonetes* of the *C. scitula* type, and traces of *Microdon* and of *Modiomorpha*.

This fauna may be seen at the base of the old inclined plane, my Station No. 27 A and B.

A little higher *Rhynchonella eximia* appears, then *Orthis impressa* and *Strophodonta mucronata*, and these half dozen species, earliest to appear in the region, are characteristic and among the most abundant species of the fauna of this Ithaca group, viz, *Spirifera mesocostalis* (1st var.), *Palæoneilo filosa*, *Orthis impressa*, *Strophodonta mucronata*, *Leiorhynchus mesocostalis*, and *Rhynchonella eximia*.

*Leiorhynchus* is peculiar in being very abundant where it appears, but when it is abundant there are generally very few other species in the same stratum.

Having passed this first stage of the introduction of the fauna, we reach a sandstone bed, calcareous in some localities, forming a fire-stone bed, which is a consolidated mass of broken fossils.

The characteristic species of this layer are *Spirifera mesostrialis* and *Cryptonella eudora*.

In several places about Ithaca this stratum is worked for quarry stone. The old McCormick quarry of the early reports, the present University quarry, and several others, are at this horizon.

The University quarry, Station No. 5, is characteristic.

#### FAUNA OF STATIONS No. 5, ETC.

*Spirifera mesostrialis*.  
*Cryptonella eudora*.  
*Spirifera mesocostalis* 1st var.  
*Gomphoceras tumidum*.  
*Cyrtina Hamiltonensis*.  
*Orthoceras bebryx* var. *Cayuga*.  
*Poteriocrinus Cornellianus*.  
*Pleurotomaria capillaria*.  
*Productella speciosa*.  
*Euomphalus Hecale*?  
*Grammysia elliptica*.  
*Rhynchonella eximia*.  
*Atrypa reticularis*.  
*Ptilophyton (Lycopodites) Vanuxemi*.  
*Rhodea* (stems).  
 Fragments of wood.  
*Stictopora Meeki*.  
*Microdon bellistriata*.  
                   *gregaria*.

*Platyceras carinatum.*  
*Modiomorpha concentrica* ?  
*Bellerophon* sp.  
*Strophodonta perplana* var. *nervosa.*  
*Rhynchonella Stephani.*  
*Zaphrentis simplex* ?  
*Stromatopora* sp.

To this fauna probably belongs *Streptorhynchus*, a single specimen of which I have seen from "Ithaca," but do not know the precise locality.

Below this zone, perhaps 50 feet, is found in a single locality, Station No. 37, a small but very abundant fauna of *Crinoids*, *Bryozoa*, and *Rhynchonella*.

FAUNA OF STATION No. 37.

*Rhynchonella eximia.*  
*Poteriocrinus gregarius.*  
*Stictopora Meeki.*  
*Spirifera mesocostalis.*  
*Cyrtina Hamiltonensis.*  
*Productella*, a small species.  
*Aviculopecten cancellatus.*  
 Plates of a large *Arthroacantha*.  
 Two or three *Bryozoa*, undetermined.  
 A small *Lycopodites*.

The first three species constitute the mass of the fauna; the others are rare.

The lithological characters are interesting. In the midst of sandy shales containing the *Brachiopods* is included a stratum of but an inch or so in thickness of fine, soft, mud shale, almost black, and containing the *Crinoids* and the small *Lycopodites*.

The *Crinoids* are minute, but occur in great numbers and exhibit considerable variation. (See Proc. Acad. Nat. Sc. Phil. 1882, p. 22.)

Passing above Station No. 5 the typical Ithaca group fauna prevails for some hundred feet or more, then gradually lessens in the number of its species and individuals, and the last species to appear is the *Spirifera mesocostalis* and *Orthis impressa*.

The fauna is found in several of the ravines about Ithaca; the best exposures are in Fall Creek and the upper part of Cascadilla Creek, and along the cutting on South Hill called the "inclined plane" in the old State reports.

FAUNA OF STATIONS No. 10, 27 C, D, ETC.

The "Ithaca fauna" proper:

*Spirifera mesocostalis* 1st var.  
*Strophodonta mucronata.*  
                     *perplana* var. *nervosa.*  
*Cyrtina Hamiltonensis.*

*Productella speciosa.*  
*Atrypa reticularis.*  
*Microdon bellistriatus.*  
*Leiorhynchus mesocostalis.*  
*Orthis impressa.*  
*Chonetes setigera.*  
*Chonetes scitula.*  
*Crania* sp.  
*Productella speciosa*, small var.  
*Lingula spatulata* var.  
*Lunulacardium fragile.*  
*Ocytherodon quadrangularis.*  
*Palæoneilo filosa.*  
*Leda* n. s.  
*Pterinopecten suborbicularis.*  
                     sp.  
*Leptodesma* (several species).  
*Actinopteria Boydii.*  
*Modiomorpha complanata.*  
*Grammysia subarcuata.*  
*Nucula* sp.  
*Aulopora* sp.  
*Orthoceras Bebryx.*  
                     *fulgidum.*  
*Bellerophon leda.*  
*Pleurotomaria capillaria.*  
*Tentaculites spiculus.*  
*Stictopora Meeki.*  
*Callopora*, Hall, sp.  
*Platyceras* sp.  
*Discina neglecta?*  
*Goniatites uniangularis?*  
*Orthoceras pecator.*  
*Arthroacantha Ithacensis.*  
*Productus dissimilis* (abundant in a single locality).  
*Rhynchonella pugnus* var. (frequent in localities).  
*?Strophodonta demissa.*

This Ithaca fauna contains a few other species, but I have given the main list in approximately the order of their abundance. The species in the early part of the list are frequently seen, and some of them are abundant in localities; those recorded lower down in the list are rare, or seen, it may be, abundantly in single strata or localities. A few, not given in the list, are not certainly of this horizon, and are on this account omitted.

It will be noticed that a few of the species of the general Portage fauna are here included, as *Palæoneilo filosa*, *Lunulacardium fragile*, and

a few *Goniatites* and *Orthoceratites*, which occur here in imperfect condition, but *Cardiola speciosa*, a characteristic Portage form, has not been detected in the midst of the Ithaca fauna.

However, a little farther south, at Station No. 68, Newfield, as the Ithaca fauna ceases, the typical Portage fauna reappears.

One hundred to one hundred and fifty feet above the termination of the Ithaca fauna, in dark, fine, argillaceous shales, appear the following species:

*Cardiola speciosa*.  
*Lunulacardium fragile*.  
*Lingula complanata*.  
*Bellerophon mæra*.  
 A small *Palæoneilo*.  
*Rhodea* stems.  
*Strophodonta mucronata*.

This is the fauna of No. 68 A and B.

This I take to be the mark of the final withdrawal of the Ithaca fauna from this geographical area, and the return of the general Portage fauna.

What is also remarkable of this fauna in this region is its withdrawal in the reverse order in which it came in.

After the Brachiopod fauna is pretty well gone, there appears a soft almost black, argillaceous shale bearing *Discinas*, and above this, almost alone, occurs *Spirifera levis*, which, it will be remembered, appeared in abundance entirely below the Ithaca fauna, and was in the zone preceding that in which the *Lingula complanata* fauna occurred.

This Ithaca fauna does not appear far west of Ithaca, but a few of its species—the Cladochonus subfauna almost entire—appear 20 miles west in ravines running into Seneca Lake.

It will be noticed that *Strophodonta mucronata* also appeared in Station No. 48, the earliest forerunner of the Ithaca fauna.

The study of the order of the faunas alone in this meridian furnishes strong evidence for the opinion that what I have called the Ithaca fauna, which was characteristic of the "Ithaca group" of the early State geologists, is geographically a temporary fauna, preceded and followed by the conditions and fauna generally regarded as belonging to the Portage group. This subject will be further discussed when the sections in other parts of the State shall be brought under consideration.

In this meridian several hundred feet of deposits follow, in which almost no fossils occur. Its general character is that of coarse arenaceous shales with thin seams of sandstone, tending, in the upper part, to flaggy and uneven, wave-marked strata. Interstratified with these are thin streaks of greenish argillaceous shales, in which are seen, rarely, the species of the Portage fauna.

This condition of things prevails, at this meridional section, until

about 1,300 feet above the top of the Genesee shale, where the first of the typical Chemung faunas appear.

The first species of this fauna, that I have detected, are on the high hill south of Ithaca, in Danby (Station No. 58), about 1,500 feet above the sea, and estimated to be stratigraphically 1,300 feet or more above the Genesee shale.

A lithological difference is clearly seen in the change from dark, tough, wave-marked, arenaceous shales with interstratified greenish argillaceous shales, to soft, coarse-bedded, blocky shales, weathering brown and rapidly disintegrating into rich yellow soil. The first species met with were from Station No. 58:

*Productella lachrymosa.*

*Ambocelia umbonata* var. *gregaria.*

*Orthis impressa* (second variety, wide and large).

*Atrypa reticularis.*

And a few other imperfect fossils.

Both east and west of this locality, in Caroline and in Newfield, are hills rising to 1,800 or 1,900 feet, and the upper part of these hills, though mainly covered by a deep coating of soil, exhibit outcrops and loose slabs and blocks, still angular (thus evidently not transported), in which the Chemung fauna appears.

Still farther south the same rocks and fauna are found, in place, at a lower level.

Numerous sections have been made along this meridian, containing the Chemung fauna. It is an abundant fauna, and it appears to have been subdivided into a few local subfaunas. Still it is difficult to speak positively here, on account of the rapid change in the detailed stratigraphical conditions. Sometimes it is difficult to trace some particular fossiliferous stratum even across a wide gorge of a few hundred feet. However, I have been able to determine the order of the subfaunas of the Chemung group as follows:

As before mentioned, traces of the fauna occur before it appears in full force, and as in the case of the Ithaca fauna, the forerunners of the Chemung fauna are characteristic species and also species of wide geological range. There are such species as *Productella lachrymosa*, *Ambocelia umbonata* var. *gregaria*, and the wide form of *Orthis impressa*.<sup>1</sup>

After these species had appeared, and far above the last traces of the Ithaca fauna, a stage of fine, fissile, argillaceous shales, in some exposures nearly black in color, appeared at the base of the series of strata bearing the main Chemung fauna. This dark shale is well represented at Van Ettenville, my Station No. 62 A. It appears also at the bottom of the cliff at lower Chemung Narrows, Station No. 67 A. In the midst of the

<sup>1</sup> In giving the names of species in this paper I have intentionally chosen those names by which the forms are more commonly designated in collections of New York fossils; points of nomenclature and comparison of local varieties with each other, and their identification with species of wider or distant geographical areas, may appropriately be left for special consideration.

shale are generally found flattened concretions of brown hematite, often inclosing a few species which are more abundant in the beds higher up. This is, so far as I know, the lowest Devonian horizon for definite agglomerations of the hematite ore.

The shales themselves carry a *Lingula* fauna, very similar to that in the dark shale at the base of the Ithaca group, but mingled with other species. These latter species appear to belong normally to the fauna of the common Chemung shales with which the *Lingula*-bearing shales are interstratified.

The following species occur in the fauna of Station No. 62 A and B:

*Lingula complanata.*

*punctata.*

*Spirifera mesocostalis* (2d var.).

*mesostrialis* (2d var.).

*Ambocælia umbonata* var. *gregaria.*

*Cyrtina Hamiltonensis.*

*Orthis impressa* (2d var.).

*Atrypa reticularis.*

*Leptodesma* sp.

*Chonetes scitula.*

Crinoid stems (? = *Taxocrinus*).

A variety of *Lingula spatulata* occurs in similar shales of Station No. 67.

The following species appear in a similar shale at about the same horizon, and I believe them to belong to the same subfauna:

*Productella speciosa* (small var.)

*Rhodea* stems.

*Palæoneilo filosa.*

*Schizodus* sp.

*Euomphalus Hecale?*

This subfauna and the containing shales gradually pass up into coarser, brown, arenaceous shales and the normal Chemung fauna.

The most northern exposure, at which the typical Chemung fauna was found in abundance, was high up in the hills in the northeastern part of Chemung County, near Park Station of the Utica, Ithaca and Elmira Railroad, between 1,400 and 1,500 feet above the sea. It is my Station No. 72, with the following fauna:

*Orthis Tioga.*

*carinata.*

*Strophodonta cayuta.*

*Productella lachrymosa.*

*Spirifera disjuncta.*

*Atrypa reticularis*, vars. *spinosa* and *hystrix.*

*Spirifera mesostrialis* (2d var.).

*Ambocælia umbonata* var. *gregaria.*

*Spirifera mesocostalis* (2d var.).

*Streptorhynchus Chemungensis*.

*Pterinea Chemungensis* (Con.).

The above are the more common species at this locality, and in every locality in this region where the Chemung fauna appears in full force. With the above are associated a long list of other species, met with more rarely in any particular locality and less universally, but in several cases locally abundant.

The cliffs along the narrows, above and below Chemung village, contain the typical Chemung fauna.

I have added some species to those already quoted from this locality by the State geologists and others.

TYPICAL CHEMUNG FAUNA (STATIONS NOS. 65, 66, AND 67).

*Orthis Tioga*.

*Streptorhynchus Chemungensis*.

*Aviculopecten pecteniformis* Hall.

(= *Pterinea Chemungensis* (Con.) ) H. S. W.

*Strophodonta Cayuta*.

*demissa*.

*Productella lachrymosa* var. *lima*.

*costatula*.

*Spirifera disjuncta*.

*Ambocælia umbonata* var. *gregaria*.

*Atrypa reticularis*.

*Rhynchonella contracta*.

*Leiorhynchus sinuatus*.

*mesocostalis*.

*Cryptonella eudora*.

*Pteronites spinigerus* Con.

*Pterinea protecta* Con.

*Avicula multilineata* Con.

*Cypricardites* (*Goniophora*) *Chemungensis*.

*Schizodus* (*Nuculites*) *Chemungensis* (Con.).

*Grammysia subarcuata* H. & Whit.

The rarer associates of this fauna are :

*Chonetes setigera*.

*Illinoisensis* ?

*Pleurotomaria capillaria*.

*Euomphalus* sp.

*Callonema* sp.

*Rhynchonella sappho*.

*Orthis michelini* L'Ev. (if distinct from *O. Vanuxemi*).

*Glyptodesma* sp.

*Bellerophon mæra*.



*Platyceras* sp.  
*Cyclonema* sp.  
*Orthis leonensis*.  
*Knorria*, a fragment.  
*Cladochonus* sp.  
*Orthis carinata* (abundant).  
*Strophodonta perplana* var. *nervosa*.  
*Taxocrinus Ithacensis*.  
*Gomphoceras*, a fragment.  
 "Fucoides graphica."  
*Spirifera fimbriata* (a single specimen in Station No. 60).  
*Spirifera mesocostalis* (2d var.).  
*Atrypa aspera*.  
*Orthis impressa* (wide var.).  
*Rhynchonella orbicularis*.  
*Discina grandis*.  
*Mytilarca Chemungensis*.

A little farther east the following species occur in the same general association :

*Tropidoleptus carinatus*.  
*Microdon bellistriatus*.  
 Crinoid stems.  
*Spirifera mesostriata* (3d var.).  
*Phacops rana*.  
*Dalmanites calliteles* ? (a trace).  
*Cyrtina Hamiltonensis*.  
*Palæoneilo bisulcata*.  
*Loxonema styliola*.  
*Productella speciosa*.

Two zones in the formation, in the midst of the general fauna and a calcareo-arenaceous rock (Nos. 67 E and H), carry the following additional species :

*Zaphrentis*, sp.  
*Heliophyllum*, near *H. Halli*.  
*Stomatopora*, sp.  
*Stictopora*, sp.  
*Tentaculites spiculus* ?  
 Crinoid stems and some other *Bryozoa* not described.

These corals, occurring as they do mainly in the condition of casts, are of little satisfaction except as marking the presence of the genera.

Prof. James Hall early recognized the "Cyathophylloid" corals in the Chemung fauna, but, so far as I know, the species are not described, nor are any species recorded from the Chemung group of New York. (Geology N. Y., Part 4, p. 255.)

A study of this typical Chemung fauna, as exhibited a few miles

each side the Chemung-Tioga County line, reveals the following general laws as to its conditions, characteristic species, and relations to other faunas.

The fauna prevails through about 250 feet of strata. The general character of these rocks is a series of alternating shales and sands, the argillaceous ingredients generally prevailing over the arenaceous, strongly ferrous, expressed rarely in the presence of ironstone concretionary nodules, but commonly recognized only by the universal iron-stain these rocks show upon weathering, and the rich, brownish-yellow color of the soil produced by their disintegration.

Near the beginning of the fauna, the shales tend to assume a fissile character, associated with the presence of the *Lingula* subfauna before mentioned.

As the fauna has reached its maximum development, a calcareo-arenaceous deposit appears carrying a rich coral and bryozoal subfauna, which reappears again toward the close of its prevalence in this area, each time marked by the continuance, for longer than usual, of undisturbed conditions favorable to the deposit of thick, solid sandstone strata. These sandstones must have been relatively local, as they vary both in thickness and in the character of the deposit, when followed along for even a few hundred feet of continuous exposure.

The Chemung fauna is recognized for a thickness of full 300 feet of strata, and the coral sandstone occurs three times in the series at Lower Chemung Narrows, and was recognized twice at the Upper Narrows. Since this sandstone is calcareous, and is marked by the presence of Cyathophylloid corals and Bryozoa, associated with the Chemung Brachiopod fauna, it becomes an important stratum in the comparison of separate sections.

In the several localities measured, the first and third coral sandstones are separated by about 250 feet of strata.

The second sandstone is in Station No. 67, about 15 feet above the first.

These sands vary considerably in thickness, and when a cliff of a few hundred yards is exposed, the corals may be abundant at one end of the cliff and no trace of them at the other, the sandstone seam itself also breaking up into alternating thin layers of shale and sandstone, and losing in great measure the calcareous character. For these reasons I have given average measurements.

There appear to have been two stages in the series in which this coral subfauna was locally abundant, and they were probably confined to limited areas in the form of shallow basins. They were separated by an average of 225 feet of shales, the majority of which was comparatively barren, but with the second incoming of the coral sandstone the principal Chemung Brachiopods returned, though not so abundantly as at first.

In some localities these sandstones are thick-bedded and form consid-

erable quarries of fair building stone. As far as determined, the highest sandstone was the more fully developed and contains the thicker bedded sandstone. Though it is possible that in some area the first two sands may have been continuous, forming 15 or 20 feet of sandstone.

Above the horizon of this upper sandstone no good exposures of the strata were found on this meridian until passing the State line and reaching Ulster, Bradford County, Pennsylvania.

In the cuttings made through the rocks by Cash Creek, exposures of Upper Chemung strata were examined. Here at my Station No. 81 a sparse fauna was obtained in a thin, semicalcareous, coarse sandstone containing considerable amount of large fragments of fossil wood and fish bones, with occasionally small pebbles. In Bradford County, Pennsylvania, the folds of the rock masses have become quite marked, as was reported by Mr. Sherwood in the Pennsylvania report, second survey, Report G.

The exposure at Cash Creek is at about the same altitude as that at Chemung Narrows, but is situated near the axis of the Blossburg Mountain Synclinal of Sherwood's Report G, p. 44.

The relation of the strata to those exposed at Chemung Narrows is a matter of calculation, and though they are certainly higher, stratigraphically, than the latter I feel no confidence in exact figures given to express the relative position.

Examination of the series farther west in the same county leads me to believe that the Ulster beds are situated within 300 feet above the upper coral sandstone of Chemung County, New York, and that there is no abundant Chemung fauna between. Further investigations may disprove this opinion, but I think it is very doubtful if the few traces of Chemung species found further south are any higher in the series than these Ulster beds.

The fauna of Station No. 81 C is as follows :

*Spirifera mesocostalis.*

*Ambocælia umbonata* var. *gregaria.*

*Strophodonta Cayuta.*

*perplana*? var. *nervosa*?

*Streptorhynchus Chemungensis.*

*Chonetes* sp.

*Spirifera*, like sp. *Carteri*, but having some features similar to *Syringothyris*, and too imperfect to determine with certainty.

*Crinoid* stem,  $\frac{1}{4}$  inch in diameter, and resembling those of Sub-Carboniferous species.

A small *Rhynchonella*.

Fragments of fish-bones.

Fragments of wood.

A few small pebbles were also seen.

This is plainly an Upper Chemung fauna. It exhibits also traces of

nearness to the conglomerate and the conditions characterizing the Catskill group.

In regard to the position in the series to which the fossiliferous beds in Franklin Township should be referred, I am in doubt. (See 2d Geol. Surv. Penn., G, p. 37.) The relation which the beds may bear to the red "Catskill" rocks above does not help the matter, since it is pretty well proven that these red rocks began to intrude themselves into the marine deposits at quite different stages in the series of different localities.

Up to the decline of the typical Chemung fauna my investigations along this meridian gave me reasonable satisfaction; but with the approach and intrusion of the coarse reds and grays the faunas were much confused and broken up. It is probable that except for local areas the majority of the fauna was destroyed.

In order to a clear understanding of the final history of these marine Devonian faunas, it will be necessary to study them in some area where these red beds (which, like the old reds of Great Britain, were probably deposited in fresh or brackish water) do not interrupt the continuity.

The elevation of land, which was evidently taking place over this area at this time, produced in some cases shore conditions where conglomerates were deposited, and in others great land-locked basins, from which, with the total or partial exclusion of salt water, the marine fauna rapidly perished.

Wherever the shores, produced by the elevation, were mere extensions of mainland with rocky exposure, we may suppose that beds of conglomerate might result; but where the land was produced by bringing the bottoms at a distance from land up to the surface, we may suppose that the nature of the deposits would not be greatly changed, except in so far as the shutting off the direct action of the sea would affect them chemically.

So long as the Chemung fauna found congenial conditions of life outside, it is reasonable to infer that its species might occasionally be intruded into these basins and thus appear interstratified with red rocks. That there was such lifting of the marine bottom to the surface, in regions where the red rocks precede conglomerate or coal, is shown by the irregular bedding and channeling of the beds, with very little change in textural qualities of the deposits which preceded the red "Catskill" deposits. Where the Chemung conditions follow up to the conglomerates, as in Western New York, this irregular bedding does not occur till the shore conditions of the conglomerate were actually present.

The present section alone does not give us the data for determining the order of the faunas in this upper part of the Devonian series.

I hope at some future time to be able to clear up this point by applying to it the results of study upon other sections.

After leaving the last fauna at Ulster, I estimate that there are ap-

proximately 1,000 feet of coarse reds and grays and conglomerates before reaching the Barclay coal, which lies some 2,000 feet above the sea. (2038. 2d Geol. Surv. Penn., G., p. 13.)

The "Ithaca group" was regarded by Mr. Vanuxem, the geologist of the third district, in 1842, as one of the primary subdivisions of the Erie division. (See Geol. N. Y., 3d Dist., p. 174.)

In 1841 Professor Hall expressed the opinion that the separation of this from the typical Chemung group was not supported by comparison of the fossils; and in 1843, in the report of the fourth district, he discarded the Ithaca group, regarding it as identical with the Chemung group, as represented along the Chemung River. (See Geol. N. Y., 4th Dist., p. 250.) The reason given was "the impossibility of identifying them as distinct by any characteristic fossils." This opinion has prevailed ever since.

Although the faunas are very similar, there can be no doubt that along the present meridian they represent two distinct geological stages. That they blended in some measure further east may be possible, in the same way that it is probable that on going westward the Marcellus and Genesee stages blended.

Although I do not doubt that the Ithaca fauna is an early stage of the Chemung fauna, I am persuaded that the two may be readily distinguished by their fossils.

That the typical Chemung fauna is thus distinct from that of the Ithaca group and characteristic of a later stage, is shown, palæontologically, by the following considerations:

The genera *Spirifera*, *Orthis*, *Strophodonta*, and *Productella* are common to both faunas, and are represented by numerous individuals at almost any fossiliferous exposures of either group. But for each genus the species are different. *Spirifera* is represented in the Ithaca group by *Sp. mesocostalis* var. *acuminata* and the first variety of *Sp. mesostrialis*.

The Chemung group is characterized by *Sp. disjuncta*, *Sp. mesocostalis* 2d var., a large, coarsely plicated, broad form, and *Sp. mesostrialis* 2d var., the wide mucronate form, neither of which is seen in the Ithaca group.

*Orthis*, in the Ithaca group, is *O. impressa* of the narrow variety, rarely wider than long.

In the Chemung group *O. impressa* is the 2d var.; wide form, with broad sinus; also there are *O. tioga* and *O. carinata*, neither of which is known in the Ithaca group.

The *Strophodontas* of the Ithaca group are *Str. mucronata*, and the closely allied variety of *Str. perplana* var. *nervosa*.

In the Chemung group *Str. cayuta* is the prevailing form, and a coarser, more irregular form of *Str. perplana* var. *nervosa*.

*Str. demissa* is reported from both groups, but is extremely rare in either.

*Productella* is represented in the Ithaca group by *P. speciosa*, and a

small form I have identified as *P. speciosa*, small variety. In the Chemung it is *P. lachrymosa* and *P. costatula*.

Besides these genera, *Streptorhynchus* is common in the Chemung group, and it is extremely rare, if it appear at all, in the Ithaca group.

*Ambocælia umbonata* var. *gregaria* is abundant in some stages of the Chemung group, but is rarely ever seen at Ithaca. The latter two forms are seen below the Ithaca group, hence their absence there is evidence of modified fauna, rather than extinction.

These differences in the prevailing varietal, or specific characters of common genera, which (as genera) are known to be common for a considerable range below and above the stages under consideration, I take to be more reliable evidence of actual difference in horizon than would be any number of distinct species of different genera in the two faunas.

#### SUMMARY.

The following is a summary of the order and general relative position of the faunas from the Genesee slate to the Barclay coal, which my present knowledge leads me to believe is true for the meridian passing through Ithaca, N. Y., running southward.

1st. Genesee slate fauna.

2d. Portage group fauna, distributed through approximately 1,300 feet of strata, but interrupted by the intrusion of the Ithaca fauna and several sub-faunas.

3d. Chemung fauna, occupying at least 1,200 feet of strata, with perhaps two sub-faunas, and driven out or destroyed by the presence of the conditions marked by the deposit of red and gray Catskill rocks.

Within the limits, assigned to the Portage group in the western part of New York State, I believe should be included for this meridian all those deposits lying between the Genesee shale and the lowest yellow-brown shale and sandstones which carry the true Chemung group fauna.

This series, as a whole, may be described as arenaceous, dark-colored shales with the *Cardiola speciosa* fauna, toward the top running into wave-marked, tough, arenaceous deposits, almost totally barren, so far as known.

The passage, between this series and the true Chemung, is stratigraphically indistinct, but in a general way it may be recognized by the clearer separation of the argillaceous from the arenaceous deposits after passing the line, and the appearance of lighter-colored sandstones in the midst of softer argillaceous shales, in which iron nodules and iron stains become more conspicuous than below.

The shales of the Portage below are thinner and of more greenish tint, and its sandstones are darker in color and thin, tough, and wave-marked or flaggy. Palæontologically, however, the transition is more marked.

The upper part of the Portage appears to be utterly barren except

in an occasional thin stratum of green shale, a *Cardiola speciosa*, or a small *Palæoneilo*, or *Leda* may appear.

As soon, however, as we reach the true Chemung rocks we meet large *Productella lachrymosa*, *Ambocælias*, and *Spirifers* of the Chemung types. Within the limits of the Portage group, as so defined, we find in this area several secondary faunas intruding, but with limited geographical distribution, some of which we are able to trace toward, if not to, their origin.

The first of these is the *Cladochonus* fauna of Station No. 48, an outlier and forerunner of the Ithaca fauna, and entering this area from the east and traced as far west as Seneca Lake.

The second is the *Spirifera lævis* fauna, also coming in from the east, and not known west of Cayuga Lake Valley.

The third is the *Lingula* fauna of the Ithaca shale, which I think may be connected with the general black shale fauna, and if so, it was intruded from the west.

Fourth, is the thin recurrent Hamilton fauna, which may have been some little colony that had escaped destruction, or remained after the general retreat of the Hamilton fauna.

It is not improbable that evidence will be found proving conclusively that, after the general prevalence of the Portage group and its fauna, the Hamilton conditions and more or less of its fauna may have continued to live in some region east and north of this area.

Fifth, was the general Ithaca fauna, with a single coral, sub-fauna, in its midst found in the one heavy bedded sandstone of that group. This sandstone is semi-conchcareous where the coral occurs, and in places it is a mass of comminuted, broken shells. In this sub-fauna, also occurs the Terebratuloid fossil *Cryptonella Eudora*.

The Ithaca fauna was substantially a Brachiopod fauna, with the characteristic forms *Spirifera mesocostalis*, *Orthis impressa*, *Strophodonta mucronata*, and *Cyrtina Hamiltonensis*, and others.

This fauna is the regular successor of the Hamilton fauna, and is intermediate between it and that of the Chemung group. It appears to have come in from the east. It prevailed during the deposition of two to three hundred feet of arenaceous shales; the coral sandstone fauna came in before its maximum development. At the close of its occupation of this area a dark, fissile shale with a *Discina* fauna came in. This I believe to be another outlier of the Genesee shale conditions, whose center at this time must have been toward the western part of the State.

A few feet above this dark shale the representatives of the *Spirifera lævis* fauna reappeared, among them a well-developed specimen of *Spirifera lævis*. Above this point the rocks are relatively barren except for the occasional presence of a small specimen of *Productella* or *Spirifera*, or traces of the Portage fauna, until the incoming of the Chemung fauna, three or four hundred feet higher up.

The Chemung fauna came in gradually, and before it was thoroughly

introduced, there appeared a dark, fissile shale very similar to that underlying the Ithaca fauna. This dark shale carried a *Lingula* fauna, the principal species of which were the same as those in the Ithaca dark shale, but the associated forms are of the upper Chemung types, showing it to be a recurrence at a later stage, and not identical with the Ithaca-*Lingula* fauna, as the stratigraphical evidence also clearly indicates.

Not long after the Chemung fauna had fully occupied the area, a massive, often calcareous sandstone was deposited, containing an interesting coral sub-fauna. Again, some 250 feet higher up in the series, and near the close of the dominance of the Chemung species, the coral subfauna reappears under like conditions.

Above this zone Chemung species are rare, but are the only marine forms to appear at all till after the deposit of the red sands and conglomerates.

Toward the close of the Chemung period there were disturbances over this area which made it impossible, with the present knowledge of the series, to define the passage of the Chemung fauna into anything higher up.

Even after traces of the red "Catskill" rocks were deposited, some of the Chemung species remained. The reds, purples, and grays, and the white conglomerates, although some thousand feet in thickness, and carrying some fish bones and scales, and fragments of plants, show very little, if any, trace of marine life.

This series is terminated by the marshy land depositions of the Barclay coal mine.

I am under obligations to the Director of the United States Geological Survey for the insertion of this report in this place. The material was collected, and the work done on it privately in connection with my duties in Cornell University. The nature of the investigations having come to the notice of the Director, I was placed in position to continue them under the auspices of the Survey. This article is therefore included here as the first of a series of articles upon the comparative palæontology of the Devonian and Carboniferous faunas.

Although I am responsible for the opinions here advanced, I owe much to the suggestions and inspiration received from others. Especially valuable have been the numerous papers in which have been discussed the problems connected with the Devonian and Old Red Sandstone deposits of Great Britain and Europe. I may mention especially those of Messrs. Etheridge, Edward Hull, and T. M. Hall; also the papers of M. Jules Gosselet upon similar series in North France, and the interesting works of Joachim Barrande in other fields.

The writings of Professor Hall have been of great value, and the suggestions appearing all along in his works have often been in mind during these investigations.

ITHACA, N. Y., December, 1883.





# INDEX.

|                                                                          | Page.      |                                                                     | Page.                  |
|--------------------------------------------------------------------------|------------|---------------------------------------------------------------------|------------------------|
| Academy of Natural Sciences, Philadelphia, proceedings of.....           | 18         | Devonian, comparative paleontology of ..                            | 31                     |
| American Association for the Advancement of Science, proceedings of..... | 7, 8       | Dip of rocks.....                                                   | 7, 8                   |
| — Journal of Science.....                                                | 13         | Discina fauna.....                                                  | 30                     |
| Barclay coal mine (Pennsylvania).....                                    | 7          | Etheridge, Robert, works of, consulted...                           | 31                     |
| Black shales.....                                                        | 7, 8, 9    | Facies of faunas.....                                               | 9                      |
| —, Devonian.....                                                         | 7-9        | Fall Creek (Ithaca).....                                            | 12                     |
| —, Genesee.....                                                          | 9          | Faunas, comparative study of.....                                   | 5, 8                   |
| —, Marcellus.....                                                        | 8          | —, problems concerning.....                                         | 5                      |
| Blossburg Mountain synclinal.....                                        | 26         | —, recent, on New England coast.....                                | 6                      |
| Bradford County (Pennsylvania).....                                      | 26, 27     | —, recurrence of.....                                               | 8                      |
| Bryozoa.....                                                             | 18, 25     | —, shifting of.....                                                 | 8                      |
| Building-stone.....                                                      | 26         | —, lists of, by stations:                                           |                        |
| Burdick's Glen, near Ithaca.....                                         | 8          | —, Chemung group, No. 58, base of, Danby, N. Y.....                 | 21                     |
| Carboniferous faunas.....                                                | 11         | —, 62 A. Lingula shales, Vanettenville, N. Y.....                   | 21, 22                 |
| Cardiola speciosa fauna.....                                             | 29         | —, 67 A. Lingula shales, Chemung Narrows, N. Y.....                 | 21                     |
| Caroline, N. Y.....                                                      | 21         | —, 65, 66, 67. Typical locality, Chemung Narrows, N. Y.....         | 23, 25                 |
| Cascadilla Creek (Ithaca).....                                           | 8          | —, 67 E. H. Coralline zone, Chemung Narrows, N. Y.....              | 24, 25                 |
| Caah Creek (Pennsylvania).....                                           | 26         | —, 72. Park station.....                                            | 22                     |
| Catskill rocks.....                                                      | 27, 28, 31 | —, 81 G. Ulster (Pa.) beds, Upper Chemung group.....                | 26                     |
| Cayuga Lake.....                                                         | 7          | —, Genesee shale, 84 D. Burdick's Ravine.....                       | 9                      |
| — Valley.....                                                            | 30         | —, Ithaca group, 5. Cryptonella zone....                            | 17                     |
| Cephalopoda.....                                                         | 12         | —, 6. Lingula shale, Ithaca.....                                    | 14                     |
| Channel-fillings.....                                                    | 13         | —, 10. Spirifera mesocoostalis zone, Ithaca.....                    | 18                     |
| Characteristic species.....                                              | 6          | —, 14 N. Recurrent Hamilton zone, Ithaca.....                       | 15                     |
| Chemung group.....                                                       | 7, 20, 31  | —, 27 A, B. Base of Ithaca group, Ithaca.....                       | 16                     |
| — fauna, first appearance of.....                                        | 21         | —, 27. Inclined plane. Ithaca.....                                  | 17                     |
| —, decline of.....                                                       | 27         | —, 37. Crinoid zone, Ithaca.....                                    | 18                     |
| —, transition to Catskill.....                                           | 30, 31     | —, 48. Cladochonus zone, Ithaca....                                 | 11                     |
| —, Upper.....                                                            | 26, 27     | —, Portage group, 1 B, D, and 4. Spirifera laevis zone, Ithaca..... | 12                     |
| —, Brachiopods.....                                                      | 25         | —, 68 A, B. Second zone of Portage group.....                       | 20                     |
| —, Lingula.....                                                          | 31         | Fish Commission, U. S., reports of.....                             | 6                      |
| — Narrows.....                                                           | 21, 22, 23 | Fossils, condition of, in the Devonian rocks.....                   | 7                      |
| — and Ithaca faunas compared.....                                        | 28, 29     | —, lists of, mentioned in this report:                              |                        |
| Cincinnati axis.....                                                     | 9          | <i>Actinopteria</i> <i>Boydii</i> Hall.....                         | 19                     |
| Cladochonus fauna.....                                                   | 11, 20, 30 | <i>Ambocaulia umbonata</i> (Conrad).....                            | 10, 15, 30             |
| Coal mine, Barclay (Pennsylvania).....                                   | 27, 28, 31 | var. <i>gregaria</i> Hall.....                                      | 11, 21, 22, 23, 26, 29 |
| Comparison of Ithaca and Chemung faunas.....                             | 28, 29     | (See <i>Spirifera subumbona</i> .).....                             | 11                     |
| Conglomerate.....                                                        | 27, 31     | <i>Arthroacantha</i> Williams.....                                  | 18                     |
| Coralline zone.....                                                      | 24, 25, 31 | <i>Ithacensis</i> Williams.....                                     | 19                     |
| Coral sandstone.....                                                     | 25, 26     | <i>Atrypa aspera</i> Schlotheim.....                                | 24                     |
| — subfauna, Ithaca.....                                                  | 30         | <i>hystrix</i> Hall.....                                            | 22                     |
| Cornell University, relation of these investigations to.....             | 31         | <i>reticularis</i> Linnæus.....                                     | 19, 21, 22, 23         |
| Corniferous limestone.....                                               | 8          | var. <i>spinosa</i> Hall.....                                       | 22                     |
| Crinoids.....                                                            | 18         | <i>Aulopora</i> , Goldfuss.....                                     | 10, 12, 19             |
| Crinoid zone.....                                                        | 18         |                                                                     |                        |
| Cryptonella zone.....                                                    | 25, 26     |                                                                     |                        |
| Cyathophylloid corals.....                                               | 25         |                                                                     |                        |
| Danby, N. Y.....                                                         | 21         |                                                                     |                        |
| Davidson's Brachiopoda, referred to.....                                 | 11, 13     |                                                                     |                        |
| Deep-sea dredging, suggestions from.....                                 | 5, 6       |                                                                     |                        |
| Devonian, upper shales.....                                              | 7          |                                                                     |                        |
| —, fossils of.....                                                       | 7          |                                                                     |                        |
| —, British.....                                                          | 11, 13     |                                                                     |                        |
| —, Black shales.....                                                     | 7, 8, 9    |                                                                     |                        |

|                                                                 | Page.                  |
|-----------------------------------------------------------------|------------------------|
| Fossils, lists of, mentioned in this report:                    |                        |
| <i>Avicula multilineata</i> Conrad.....                         | 23                     |
| <i>proteata</i> Conrad. (See <i>Pterinea</i> )                  | 23                     |
| <i>spinigera</i> Conrad. (See <i>Pteronites</i> )               | 23                     |
| <i>Aviculopecten</i> sp.....                                    | 12                     |
| <i>cancellatus</i> Hall.....                                    | 18                     |
| <i>pecteniformis</i> Hall.....                                  | 23                     |
| <i>subdeussata</i> Hall.....                                    | 15                     |
| <i>Bellerophon</i> sp.....                                      | 18                     |
| <i>Leda</i> Hall.....                                           | 19                     |
| <i>Mæra</i> Hall.....                                           | 20, 23                 |
| <i>Bryozoa</i> .....                                            | 18, 24                 |
| <i>Callopora</i> sp.....                                        | 19                     |
| <i>Callonema</i> sp.....                                        | 23                     |
| <i>Cardiola speciosa</i> Hall.....                              | 10, 11, 12, 20, 30     |
| <i>transversa</i> Hall.....                                     | 12                     |
| <i>Cardiomorpha suborbicularis</i> H.....                       | 13                     |
| <i>Chonetes lepida</i> Hall.....                                | 10, 11, 12             |
| <i>Illinoisensis</i> !.....                                     | 23                     |
| <i>acutula</i> Hall.....                                        | 19, 22                 |
| <i>setigera</i> Hall.....                                       | 19, 23                 |
| sp.....                                                         | 26                     |
| <i>Cladochonus</i> McCoy.....                                   | 12, 24                 |
| n. sp.....                                                      | 11                     |
| <i>Coleolus</i> sp.....                                         | 11                     |
| <i>aciculum</i> Hall.....                                       | 11                     |
| <i>Coleoprion</i> sp.....                                       | 12                     |
| <i>Orania</i> sp.....                                           | 13, 19                 |
| Crinoid stems.....                                              | 11, 18, 24, 26         |
| <i>Cryptonella Eudora</i> Hall.....                             | 17, 23, 30             |
| <i>Cyclonema</i> sp.....                                        | 24                     |
| <i>Cypriocardites (Goniophora) Chemungensis</i> Vanuxem.....    | 23                     |
| <i>Cyrtina Hamiltonensis</i> Hall.....                          | 12, 17, 18, 22, 24, 30 |
| <i>Cytherodon</i> . (See <i>Schizodus</i> ).....                | 19                     |
| <i>Dalmanites callitales</i> Green5.....                        | 24                     |
| <i>Discina Lamarck</i> .....                                    | 20, 30                 |
| <i>grandis</i> Vanuxem.....                                     | 24                     |
| <i>Lodensis</i> (Vanuxem).....                                  | 9, 10                  |
| <i>neglecta</i> Hall.....                                       | 13, 19                 |
| <i>truncata</i> Hall.....                                       | 9, 10                  |
| <i>Eodon</i> Hall (Miller, 1877). (See <i>Microdon</i> Conrad.) |                        |
| <i>Euomphalus</i> sp.....                                       | 23                     |
| <i>Hecale</i> Hall.....                                         | 17, 22                 |
| Fish-bones.....                                                 | 13, 26                 |
| <i>Fucoides graphica</i> Hall.....                              | 24                     |
| <i>Glyptodesma</i> sp.....                                      | 23                     |
| <i>Gomphoceras</i> , fragment.....                              | 24                     |
| <i>tumidum</i> Hall.....                                        | 11                     |
| <i>Goniatites complanatus</i> Hall.....                         | 11, 12, 14             |
| var. <i>perlatus</i> H.....                                     | 12                     |
| <i>discoideus</i> Hall.....                                     | 12                     |
| <i>uniangularis</i> Conrad.....                                 | 19                     |
| <i>Grammysia arcuata</i> (Conrad).....                          | 13                     |
| <i>elliptica</i> Hall.....                                      | 17                     |
| <i>subarcuata</i> Hall.....                                     | 11, 12, 13, 19, 23     |
| <i>Heliophyllum Halli</i> Edwards & Halme.....                  | 24                     |
| <i>Hyalolithes</i> sp.....                                      | 10                     |
| <i>actis</i> Hall.....                                          | 12                     |
| <i>Knorria</i> , fragment of.....                               | 24                     |
| <i>Leda curta</i> Meek.....                                     | 11                     |
| <i>perstriata</i> Hall.....                                     | 18                     |
| sp.....                                                         | 19, 30                 |
| <i>Leiorhynchus</i> Hall.....                                   | 14, 16, 17             |

|                                                                                              | Page.                      |
|----------------------------------------------------------------------------------------------|----------------------------|
| Fossils, lists of, mentioned in this report:                                                 |                            |
| <i>Leiorhynchus globuliformis</i> (Vanuxem).....                                             | 16                         |
| <i>limitaris</i> (Vanuxem).....                                                              | 14, 16                     |
| <i>mesocostalis</i> Hall.....                                                                | 11, 13, 14, 15, 17, 19, 23 |
| <i>multicosta</i> Hall.....                                                                  | 16                         |
| <i>quadriricostatus</i> (Vanuxem).....                                                       | 9, 14                      |
| <i>sinuatus</i> Hall.....                                                                    | 16, 23                     |
| <i>Leperditia</i> Roualt.....                                                                | 13                         |
| <i>Lepidodendron</i> Sternberg.....                                                          | 9                          |
| <i>Leptoderma</i> Hall. (See <i>Avicula</i> ).....                                           | 14, 19, 22                 |
| <i>Lingula</i> Brugnière.....                                                                | 10, 13, 15                 |
| <i>complanata</i> Williams.....                                                              | 14, 15, 20, 23             |
| <i>concentrica</i> Hall.....                                                                 | 9                          |
| <i>ligea</i> Hall.....                                                                       | 14, 15                     |
| var. Hall.....                                                                               | 15                         |
| <i>Manni</i> Hall.....                                                                       | 15                         |
| <i>membranacea</i> Winchell.....                                                             | 15                         |
| <i>punctata</i> Hall.....                                                                    | 14, 15, 16, 22             |
| <i>spatulata</i> Vanuxem.....                                                                | 9                          |
| var.....                                                                                     | 14, 19, 22                 |
| <i>Stauntoniana</i> Rathbone.....                                                            | 15                         |
| <i>Lozonema delphicola</i> Hall.....                                                         | 15                         |
| <i>styliola</i> Hall.....                                                                    | 24                         |
| sp.....                                                                                      | 14                         |
| <i>Lunulacardium acutirostrum</i> Hall. (See <i>Pinnopsis</i> ).....                         | 10                         |
| <i>fragile</i> Hall.....                                                                     | 10, 12, 14, 19, 20         |
| <i>ornatum</i> Hall.....                                                                     | 10                         |
| <i>Lycopodites</i> Brogniart. (See <i>Ptilophyton</i> Dawson and <i>Plumalina</i> Hall)..... | 13, 14, 18                 |
| <i>Macrodon</i> Lycett.....                                                                  | 11                         |
| <i>Microdon</i> Conrad. (See <i>Eodon</i> Hall; Miller, 1877.)                               |                            |
| <i>bellistriata</i> Conrad.....                                                              | 17, 19, 24                 |
| <i>gregaria</i> Hall.....                                                                    | 14, 17                     |
| <i>tenuistriata</i> Hall.....                                                                | 15                         |
| <i>Modiomorpha complanata</i> Hall.....                                                      | 15, 19                     |
| <i>concentrica</i> (Conrad).....                                                             | 18                         |
| <i>subalata</i> (Conrad).....                                                                | 12, 13                     |
| <i>Mytilarca Chemungensis</i> (Conrad).....                                                  | 24                         |
| <i>Nucula Randalli</i> Hall.....                                                             | 11                         |
| sp.....                                                                                      | 10, 19                     |
| <i>Nuculites oblongatus</i> Conrad.....                                                      | 11                         |
| <i>Orthis</i> Dalman.....                                                                    | 28                         |
| <i>carinata</i> Hall.....                                                                    | 22, 24, 28                 |
| <i>impressa</i> Hall.....                                                                    | 17, 19, 21, 22, 24, 28, 30 |
| <i>interlineata</i> Sowerby.....                                                             | 11                         |
| <i>Leonensis</i> Hall.....                                                                   | 24                         |
| <i>Michelinii</i> L'Eveille.....                                                             | 23                         |
| <i>Tioga</i> Hall.....                                                                       | 22, 23, 26                 |
| <i>Vanuxemi</i> Hall.....                                                                    | 23                         |
| <i>Orthoceras anguis</i> Hall.....                                                           | 12                         |
| <i>Bebryz</i> Hall.....                                                                      | 11, 19                     |
| var. <i>Cayuga</i> Hall.....                                                                 | 17                         |
| <i>pecator</i> Hall.....                                                                     | 12, 14, 19                 |
| <i>subulatum</i> Hall.....                                                                   | 9                          |
| sp.....                                                                                      | 15                         |
| <i>Paleoneilo bisulcata</i> Hall.....                                                        | 24                         |
| <i>brevis</i> Hall.....                                                                      | 14                         |
| <i>constricta</i> (Conrad).....                                                              | 12                         |
| <i>florea</i> (Conrad).....                                                                  | 11, 12, 14, 19, 22         |
| sp.....                                                                                      | 13, 16, 20, 30             |
| <i>Phacops rana</i> Green.....                                                               | 24                         |
| <i>Phthonia lirata</i> Hall.....                                                             | 10, 14                     |

|                                                                                | Page.                         |                                                                             | Page.              |
|--------------------------------------------------------------------------------|-------------------------------|-----------------------------------------------------------------------------|--------------------|
| <b>Fossils, lists of, mentioned in this report:</b>                            |                               | <b>Fossils, lists of, mentioned in this report:</b>                         |                    |
| <i>Pinnopsis</i> . (See <i>Lunulacardium</i> ).....                            | 10                            | <i>Stomatopora</i> Bronn.....                                               | 24                 |
| <i>Platyceras</i> <i>carinatum</i> Hall.....                                   | 18                            | <i>Streptorhynchus</i> <i>Chemungensis</i> (Conrad).....                    | 18, 23, 26, 29     |
| sp.....                                                                        | 19, 24                        | <i>Stromatopora</i> Goldfuss.....                                           | 18                 |
| <i>Pleuronotaria</i> <i>capillaria</i> Conrad.....                             | 14, 15, 17, 19, 23            | <i>Strophodonta</i> Hall.....                                               | 28                 |
| sp.....                                                                        | 13                            | <i>Cayuta</i> Hall.....                                                     | 22, 23, 26, 28     |
| <i>Plumalina</i> Hall. (See <i>Ptilophyton</i> Dawson).....                    | 13, 14, 18                    | <i>demissa</i> (Conrad).....                                                | 19, 23, 28         |
| <i>Porcellia</i> <i>Nais</i> (Hall).....                                       | 12                            | <i>Strophodonta</i> <i>mucronata</i> (Conrad).....                          | 11, 18, 20, 28, 30 |
| <i>Pterocrinus</i> <i>Cornellianus</i> Williams.....                           | 17                            | <i>perplana</i> var. <i>nervosa</i> , Hall.....                             | 18, 24, 26, 18     |
| ( <i>Decadocrinus</i> ) <i>gregarius</i> Williams.....                         | 18                            | <i>Styliola</i> <i> fissurella</i> Hall.....                                | 12, 14             |
| stems.....                                                                     | 14                            | <i>Syringothyris</i> Winchell.....                                          | 26                 |
| <i>Præacordium</i> <i>retusum</i> Hall.....                                    | 13                            | <i>Tazocrinus</i> <i>Ithacensis</i> Williams.....                           | 12, 24             |
| <i>Productella</i> <i>costatula</i> Hall.....                                  | 23, 29                        | stems.....                                                                  | 22                 |
| <i>lachrymosa</i> (Conrad).....                                                | 21, 22, 29                    | <i>Tentaculites</i> <i>gracilistriatus</i> Hall.....                        | 9                  |
| var. <i>lima</i> (Conrad).....                                                 | 23                            | <i>spiculus</i> Hall.....                                                   | 19, 24             |
| <i>speciosa</i> Hall.....                                                      | 17, 19, 24, 28                | <i>Tropidoleptus</i> <i>carinatus</i> (Conrad).....                         | 24                 |
| small variety.....                                                             | 19, 22, 29                    | <i>Ungulina</i> <i>suborbicularis</i> Hall. (See <i>Cardiomorpha</i> )..... | 13                 |
| <i>truncata</i> Hall.....                                                      | 14                            | <i>Zaphrentis</i> <i>simplex</i> (Hall).....                                | 18                 |
| sp.....                                                                        | 14, 18, 28, 30                | sp.....                                                                     | 24                 |
| <i>Productus</i> <i>disimilis</i> .....                                        | 19                            | Franklin Township (Pennsylvania), horizon of.....                           | 27                 |
| <i>Purina</i> <i>Chemungensis</i> (Conrad).....                                | 22, 23                        | Genesee shale.....                                                          | 21, 29, 30         |
| <i>protecta</i> (Conrad). (See <i>Avicula</i> ).....                           | 23                            | —, comparison, with Marcellus shale.....                                    | 28                 |
| <i>Purinopecten</i> <i>suborbicularis</i> Hall.....                            | 19                            | Geology of New York.....                                                    | 28                 |
| sp.....                                                                        | 19                            | —, Hall's report on fourth district.....                                    | 28                 |
| <i>Puronia</i> <i>spinigerus</i> (Conrad). (See <i>Avicula</i> ).....          | 13                            | —, Vanuxem's report on third district.....                                  | 28                 |
| <i>Ptilophyton</i> Dawson.....                                                 | 14                            | Gosselet, M. Jules, papers consulted.....                                   | 31                 |
| <i>Ptilophyton</i> Dawson. (See <i>Lycopodites</i> and <i>Plumalina</i> )..... | 13, 14, 18                    | Green shales at base of Portage group.....                                  | 10                 |
| ( <i>Lycopodites</i> ) <i>Vanuxemi</i> Dawson.....                             | 13, 14, 17                    | Hall, Prof. James, geological reports of.....                               | 28                 |
| <i>Rachiopteris</i> <i>punctata</i> Dawson.....                                | 14                            | —, valuable suggestions from works of.....                                  | 8, 31              |
| <i>Rhodes</i> <i>pinnata</i> Dawson.....                                       | 10                            | Hall, T. M., works consulted.....                                           | 31                 |
| stems.....                                                                     | 9, 11, 13, 14, 20, 22         | Hamilton group.....                                                         | 7, 9               |
| <i>Rhynchonella</i> <i>contracta</i> Hall.....                                 | 15, 23                        | — fauna, recurrent.....                                                     | 15, 30             |
| <i>aximila</i> Hall.....                                                       | 14, 17                        | Hematite concretions and ore.....                                           | 22                 |
| <i>orbicularis</i> Hall.....                                                   | 24                            | — lowest in Devonian rocks.....                                             | 22                 |
| <i>pugnax</i> Martin, var.....                                                 | 19                            | Hall, Edw., works consulted.....                                            | 31                 |
| <i>Sappho</i> Hall.....                                                        | 23                            | Initiation of new forms.....                                                | 8                  |
| <i>Stephani</i> Hall.....                                                      | 18                            | Iron nodules and stains.....                                                | 29                 |
| sp.....                                                                        | 26                            | Ithaca, N. Y.....                                                           | 8, 29              |
| <i>Schismaella</i> <i>Chemungensis</i> (Conrad).....                           | 23                            | — group.....                                                                | 9, 16, 28          |
| <i>quadrangularis</i> Hall. (See <i>Ocyrodon</i> ).....                        | 19, 22                        | — fauna.....                                                                | 30                 |
| <i>Spirifer</i> Sowerby.....                                                   | 12, 28, 30                    | —, a temporary fauna.....                                                   | 20                 |
| <i>angusta</i> Hall.....                                                       | 15                            | —, first appearance of.....                                                 | 16                 |
| <i>Carteri</i> Hall.....                                                       | 26                            | —, withdrawal of.....                                                       | 20                 |
| <i>curvata</i> Schlothelm.....                                                 | 13                            | — in the midst of Portage group.....                                        | 20                 |
| <i>disjuncta</i> Sowerby.....                                                  | 11, 22, 23, 28                | — inclined plane.....                                                       | 18                 |
| <i>imbriata</i> (Conrad).....                                                  | 15, 24                        | — and Chemung faunas compared.....                                          | 28                 |
| <i>glabra</i> Martin.....                                                      | 13                            | Lamellibranchiata.....                                                      | 12                 |
| <i>lavis</i> Hall.....                                                         | 11, 12, 13, 20                | Leliorhynchus, comparative study of.....                                    | 14                 |
| <i>Maia</i> (Billings).....                                                    | 13                            | —, plasticity and variation of characters.....                              | 14                 |
| <i>mesocostalis</i> Hall.....                                                  | 9, 17, 18, 22, 23, 24, 26, 28 | —, a delicate test of horizon.....                                          | 14, 16             |
| var. <i>prolata</i> (Vanuxem).....                                             | 9                             | —, abundance of.....                                                        | 17                 |
| var. <i>acuminata</i> Hall.....                                                | 9, 28                         | Lingula, comparison of several species.....                                 | 15                 |
| <i>mesostriata</i> Hall.....                                                   | 17, 22, 24, 28                | — fauna of Chemung group.....                                               | 21, 22, 31         |
| <i>subumbona</i> Hall.....                                                     | 11                            | — Ithaca group.....                                                         | 30, 31             |
| <i>Urti</i> Fleming.....                                                       | 11                            | — shales.....                                                               | 14, 21, 22         |
| <i>Spirifer</i> <i>Lamarck</i> .....                                           | 14                            | Lycopodites beds (Ithaca, N. Y.).....                                       | 13                 |
| <i>Spirifer</i> <i>Maeki</i> (Nicholson).....                                  | 13, 17, 18, 19                | Marcellus black shale.....                                                  | 8                  |
| sp.....                                                                        | 24                            | — comparison with Genesee shale.....                                        | 28                 |
|                                                                                |                               | Marine Devonian faunas.....                                                 | 27                 |
|                                                                                |                               | McCormick quarry (Ithaca).....                                              | 17                 |
|                                                                                |                               | McKinney's Station, Cayuga Lake R. R.....                                   | 11                 |
|                                                                                |                               | Murchison's Siluria, quoted.....                                            | 11                 |

|                                             | Page.                        |                                            | Page.     |
|---------------------------------------------|------------------------------|--------------------------------------------|-----------|
| Names, specific, use and abuse of .....     | 8, 9, 21                     | Seneca Lake.....                           | 30        |
| Newfield (N. Y.) .....                      | 21                           | Sherwood, Mr. A., Report G, 2d Penn-       |           |
| New York, Devonian of .....                 | 8, 16                        | sylvania Survey .....                      | 26        |
| —, Erie Division.....                       | 28                           | Species, varietal modifications of.....    | 9         |
| —, reports of State survey.....             | 7, 11, 15, 17, 24, 28        | — as mark of changed horizon .....         | 9         |
| North Devon series .....                    | 11                           | Specific names, use of.....                | 8, 21     |
| Ocean, as affecting faunas .....            | 5                            | —, deception caused by.....                | 9         |
| Ocean currents, as affecting distribution.. | 5                            | <i>Spirifera levis</i> fauna.....          | 9, 12, 30 |
| Ohio, black shales of .....                 | 9                            | — —, second appearance of.....             | 20, 30    |
| — —, <i>Spirifera Maie</i> in .....         | 18                           | — <i>mesocostalis</i> zone.....            | 18        |
| Ontario, <i>Spirifera Maie</i> in.....      | 33                           | — —, variations of .....                   | 9, 17, 28 |
| Old Red Sandstone, study of .....           | 31                           | State surveys, reports of faunas unsatis-  |           |
| Organisms, range and distribution of.....   | 5                            | factory.....                               | 6         |
| —, historical sequence of.....              | 6                            | Stratigraphical characters of rocks.....   | 5         |
| —, typical forms of.....                    | 8                            | —, irregular bedding and channeling.....   | 27        |
| Paleontology, comparative, of Devonian..    | 31                           | Subcarboniferous .....                     | 26        |
| Park Station (U. I. and E. R. R.), N. Y.... | 23                           | Summary of the order of faunas.....        | 29-31     |
| Pebbles, in Upper Chemung.....              | 26                           | Trenton limestone.....                     | 9         |
| Pennsylvania, 2d Geol. Survey, Reports      |                              | Tully limestone .....                      | 9         |
| of .....                                    | 7, 26, 27, 28                | United States Geological Survey, Direc-    |           |
| Plasticity of varietal characters.....      | 8, 14, 16                    | tor of, obligations to .....               | 31        |
| Portage group and fauna.....                | 7, 8, 11, 13, 19, 20, 29, 30 | University, Cornell, relations to .....    | 31        |
| — pyrite nodules in .....                   | 10                           | — quarry (Ithaca).....                     | 17        |
| — secondary faunas of.....                  | 30                           | Utica slate .....                          | 9         |
| — second appearance of .....                | 20                           | Van Ettenville, N. Y .....                 | 21        |
| Pteropods .....                             | 12                           | Vanuxem, Mr., geological report of .....   | 28        |
| Pyrite nodules .....                        | 10                           | Verrill, Professor, information from ..... | 6         |
| Sections, special preparation of.....       | 7                            | Wood, fragments of.....                    | 17, 26    |
| Section, meridional, of 76° 30'. (New York  |                              | Zoology, recent, as bearing upon study of  |           |
| and Pennsylvania).....                      | 7                            | fossil faunas .....                        | 5, 6      |

## ADVERTISEMENT.

---

The publications of the United States Geological Survey are issued in accordance with the statute approved March 3, 1879, which declares that—

"The publications of the Geological Survey shall consist of the annual report of operations, geological and economic maps illustrating the resources and classifications of the lands, and reports upon general and economic geology and paleontology. The annual report of operations of the Geological Survey shall accompany the annual report of the Secretary of the Interior. All special memoirs and reports of said Survey shall be issued in uniform quarto series if deemed necessary by the Director, but otherwise in ordinary octavos. Three thousand copies of each shall be published for scientific exchanges and for sale at the price of publication; and all literary and cartographic materials received in exchange shall be the property of the United States and form a part of the library of the organization. And the money resulting from the sale of such publications shall be covered into the Treasury of the United States."

### ANNUAL REPORTS.

From the above it will be seen that only the Annual Reports, which form parts of the reports of the Secretary of the Interior and are printed as executive documents, are available for gratuitous distribution. A number of these are furnished the Survey for its exchange list, but the bulk of them are supplied directly, through the document rooms of Congress, to members of the Senate and House. Except, therefore, in those cases in which an extra number is supplied to this office by special resolution, application must be made to members of Congress for the Annual Reports, as for all other executive documents.

Of these Annals there have been already published:

- I. First Annual Report to the Hon. Carl Schurz, by Clarence King. Washington, 1880. 8°. 79 pp. 1 map.—A preliminary report describing plan of organization and publications.
- II. Report of the Director of the United States Geological Survey for 1880-'81, by J. W. Powell. Washington, 1882. 8°. iv, 588 pp. 61 pl. 1 map.
- III. Third Annual Report of the United States Geological Survey, 1881-'82, by J. W. Powell. Washington, 1883. 8°. xviii, 564 pp. 67 pl. and maps.
- IV. Fourth Annual Report of the United States Geological Survey, 1882-'83, by J. W. Powell. Washington, 1884. 8°. xii, 473 pp. 85 pl. and maps.

### MONOGRAPHS.

The Monographs of the Survey are printed for the Survey alone, and can be distributed by it only through a fair exchange for books needed in its library, or through the sale of those copies over and above the number needed for such exchange. They are not for gratuitous distribution.

So far as already determined upon, the list of these Monographs is as follows:

- I. The Precious Metals, by Clarence King. In preparation.
- II. Tertiary History of the Grand Cañon District, with atlas, by Capt. C. E. Dutton. Published.
- III. Geology of the Comstock Lode and Washoe District, with atlas, by George F. Becker. Published.
- IV. Comstock Mining and Miners, by Elliot Lord. In press.
- V. Copper-bearing Rocks of Lake Superior, by Prof. R. D. Irving. In press.
- VI. Older Mesozoic Flora of Virginia, by Prof. Wm. M. Fontaine. In press.
- VII. Silver-lead Deposits of Eureka, Nevada, by Joseph S. Curtis. In press.
- VIII. Paleontology of the Eureka District, Nevada, by Charles D. Walcott. In press.
- Geology and Mining Industry of Leadville, with atlas, by S. F. Emmons. In preparation.
- Geology of the Eureka Mining District, Nevada, with atlas, by Arnold Hague. In preparation.
- Coal of the United States, by Prof. R. Pumpelly. In preparation.
- Iron in the United States, by Prof. R. Pumpelly. In preparation.
- Lesser Metals and General Mining Resources, by Prof. R. Pumpelly. In preparation.
- Lake Bonneville, by G. K. Gilbert. In preparation.
- Dinocerata. A monograph on an extinct order of Ungulates, by Prof. O. C. Marsh. In press.

Bull. No. 4.

## ADVERTISEMENT.

Sauropoda, by Prof. O. C. Marsh. In preparation.

Stegosauria, by Prof. O. C. Marsh. In preparation.

Of these monographs, Nos. II and III are published, viz:

II. Tertiary History of the Grand Cañon District, with atlas, by C. E. Dutton, Capt. U. S. A. 1882. 4°. 264 pp. 42 pl. and atlas of 26 double sheets folio. Price \$10.12.

III. Geology of the Comstock Lode and Washoe District, with atlas, by G. F. Becker. 1883. 4°. XV, 422 pp. 7 pl. and atlas of 21 sheets folio. Price \$11.

Nos. IV, V, VI, VII, and VIII are in press and will appear in quick succession. The others, to which numbers are not assigned, are in preparation.

## BULLETINS.

The Bulletins of the survey will contain such papers relating to the general purpose of its work as do not properly come under the heads of ANNUAL REPORTS or MONOGRAPHS.

Each of these Bulletins will contain but one paper, and be complete in itself. They will, however, be numbered in a continuous series, and will in time be united into volumes of convenient size. To facilitate this each Bulletin will have two paginations, one proper to itself, and another which belongs to it as part of the volume.

Of this series of Bulletins there have already been published:

1. On Hypersthene-Andesite and on Triclinic Pyroxene in Augitic Rocks, by Whitman Cross, with a Geological Sketch of Buffalo Peaks, Colorado, by S. F. Emmons. Washington, 1883. 8°. 42 pp. 2 pl. Price 10 cents.

2. Gold and Silver Conversion Tables, by A. Williams, jr. Washington, 1883. 8°. 8 pp. Price 5 cents.

3. On the Fossil Faunas of the Upper Devonian along the meridian of  $76^{\circ}30'$ , from Tompkins County, N. Y., to Bradford County, Pa., by Henry S. Williams. 1884. 8°. 36 pp. Price 5 cents.

4. On Mesozoic Fossils, by Charles A. White. 1884. 8°. 36 pp. 9 pl. Price 35 cents.

## STATISTICAL PAPERS.

A fourth series of publications having special reference to the mineral resources of the United States is contemplated. Of that series the first has been published, viz: Mineral Resources of the United States, by Albert Williams, Jr. 1883. 8°. xviii, 813 pp. Price 50 cents.

Correspondence relating to the publications of the Survey, and all remittances, which must be by postal note or money-order, should be addressed to the

DIRECTOR OF THE UNITED STATES GEOLOGICAL SURVEY,

Washington, D. C.

WASHINGTON, D. C.: May 1, 1884.

DEPARTMENT OF THE INTERIOR

---

BULLETIN

OF THE

UNITED STATES

GEOLOGICAL SURVEY

No 4.



WASHINGTON  
GOVERNMENT PRINTING OFFICE  
1884





UNITED STATES GEOLOGICAL SURVEY

J. W. POWELL DIRECTOR

---

ON

# MESOZOIC FOSSILS

BY

CHARLES A. WHITE, M. D.



WASHINGTON  
GOVERNMENT PRINTING OFFICE  
1884



## CONTENTS.

|                                                                                                                         | Page. |
|-------------------------------------------------------------------------------------------------------------------------|-------|
| Description of certain aberrant forms of the Chamidæ from the Cretaceous rocks of Texas.....                            | 5     |
| On a small collection of Mesozoic fossils obtained in Alaska by Mr. W. H. Dall, of the United States Coast Survey ..... | 10    |
| On the Nautiloid, genus <i>Enclimatoceras</i> Hyatt, and a description of the type species.....                         | 16    |

## ILLUSTRATIONS.

|              |                                                                                                                            |    |
|--------------|----------------------------------------------------------------------------------------------------------------------------|----|
| <b>PLATE</b> | I.— <i>Requienia patagiata</i> .....                                                                                       | 20 |
|              | II.— <i>Requienia patagiata</i> and <i>R. texana</i> .....                                                                 | 22 |
|              | III.— <i>Monopleura marcida</i> .....                                                                                      | 24 |
|              | IV.— <i>Monopleura marcida</i> .....                                                                                       | 26 |
|              | V.— <i>Monopleura pinguicula</i> .....                                                                                     | 28 |
|              | VI.— <i>Cyprina?</i> <i>dallii</i> , <i>Aucella concentrica</i> , var., and <i>Belemnites macri-</i><br><i>tatis</i> ..... | 30 |
|              | VII.— <i>Enclimatoceras ulrichi</i> .....                                                                                  | 32 |
|              | VIII.— <i>Enclimatoceras ulrichi</i> .....                                                                                 | 34 |
|              | IX.— <i>Enclimatoceras ulrichi</i> .....                                                                                   | 36 |



# ON MESOZOIC FOSSILS.

---

BY CHARLES A. WHITE.

---

## DESCRIPTION OF CERTAIN ABERRANT FORMS OF THE CHAMIDÆ FROM THE CRETACEOUS ROCKS OF TEXAS.

Although the Cretaceous strata of Texas have long been known to possess great and peculiar interest, comparatively little systematic study has yet been given to their paleontology; and their place in the Cretaceous series, especially that of the lower portion of the formation there, is not yet satisfactorily known. Indeed, the relation of the Cretaceous rocks of Texas to those of the other portions of the continent farther to the northward is yet doubtful; and as it is expected that parties of the United States Geological Survey will soon take up the systematic study of the geology of Texas, I shall not now attempt any general discussion of the subject. However, as this article is devoted to the description of certain forms, the like of which in North America have been found only in the Cretaceous rocks of Texas, it is proper that I should mention certain conspicuous differences between the fauna of the Texan Cretaceous and the faunas of the rocks of that period in all other parts of the continent, so far as they are yet known.

These faunal differences are so great that they are suggestive of a difference in the age of the strata containing the respective faunas; but still I suspect that they are due largely to climatic or other causes which have controlled the development and geographical distribution of species. The extent of these faunal differences can of course be fully shown only by a complete series of illustrations, such as can be prepared only after many years of paleontological labor. Therefore only the more striking examples will be mentioned. The Actinozoa are represented by a considerable number of species and genera in the Texan Cretaceous, while only a few traces of the whole class have yet been discovered in all the strata of that period to the northward. Several families of Echinoids are well represented in the Texan strata, while only two or three specimens, of one species, are yet known to exist in all the region to the northward. The Rudistæ are yet known only in the southern Cretaceous strata, where they are not uncommon. The same is true of the aberrant forms of the Chamidæ, such as are described in this article; for I do not regard the shell described by Conrad from the Upper Missouri River region under the name of \* *Requienia senseni*, as belonging

---

\* See Jour. Acad. Nat. Sci., Philad., Vol. II, p. 299.

to either that or any related genus. Certain genera also are represented in the southern, and not in the northern districts. Thus *Exogyra* and *Gryphaea* are abundantly represented in Texan and other southern Cretaceous strata, but they have not been found in rocks of that age north of about latitude 35°, in the interior part of the continent.

The fossils described in this article were collected by Mr. George Stolley from the vicinity of Austin, Tex., and sent by him to the Smithsonian Institution; and permission to use the same has been given by the Director of the United States National Museum. The three new forms herein described were found associated together; but the *Caprotina* (= *Requienia*) *texana* of Roemer was not found associated with them in the same layers. The collection containing the new forms is a very interesting one, but it is made up largely of those three species. A few examples of *Lucina*, *Cerithium*, and other mollusks were found associated with them, and also a species of *Cladophyllia*. The condition of preservation of these fossils is peculiar, nearly all of them being pseudomorphs in almost pure calcite. This condition, while it has preserved the form of the shells quite completely, has entirely obliterated the minute structure of the test which, in the species here described, it would be desirable to know.

Some diversity of opinion has prevailed among paleontologists as to the true zoological position of the forms which are described on the following pages, and other forms closely related to them; but it is now generally agreed that they have close affinities with the Chamidæ, to which family they are here referred. I think, however, that while they all ought to be placed near *Chama*, the forms which are usually ranged under the generic names *Diceras*, *Requienia*, *Monopleura*, *Caprotina*, &c., ought to be separated from the typical chamidæ as one or more groups or subfamilies.

#### Genus REQUIENIA Matheron.

##### REQUIENIA PATAGIATA (sp. nov.).

Plate I, Figs. 1-8; and Plate II, Figs. 1-4.

Shell, irregular in shape; test, moderately thick; left valve, much larger than the right, spiral, the spire being more or less distorted and much elevated, consisting of two or three volutions; the scar of attachment at the apex always present, but sometimes very small; the upper side of the spire flattened, broad; the under side regularly convex, meeting the flattened upper side at a distinct peripheral angle, which angle usually bears a prominent, thin, more or less wrinkled carina or fringe. Right valve more regular in shape than the left; the under side convex and the upper flattened, the two sides meeting at an angle similar to that of the left valve, but it is not quite so acute, and it is not fringed; the spire sometimes nearly flat, but usually more or less elevated, making about two volutions; ligamental groove narrow, and

having, especially upon the larger valve, somewhat the appearance of a spiral suture. Hinge strong, the principal tooth of the right valve being large and prominent. Surface marked by irregular lines and wrinkles of growth.

It is difficult to state the dimensions of a shell so irregular in shape as those of this species are; but the extreme measurement of an adult shell may be given as about 55 millimeters.

The irregular shape of the shell seems to be in a good degree the result of a natural habit of the mollusk, but it was in many cases evidently the result, in part, of the contact which it had with other substances. The beak of the left valve is usually distorted by reason of its early attachment to a foreign body; and shells of its own or other species were frequently attached to its surface, adding still further to its disfigurement. (Museum number, 12363.)

#### REQUIENIA TEXANA Roemer.

(Plate II, Figs. 5, 6, and 7.)

*Caprotina texana* Roemer, 1852; Kreidebildungen von Texas, page 80, Plate V, Figs. 2a, 2b, and 2c.

Shell very inequivalved, thin, smooth, subtriangular; the larger valve coiled to the right, the terminal volution forming a low, small coil; the upper side flattened, and marked by obsolete spiral lines which are crossed by slightly undulating lines of growth; outer side regularly convex, and marked by oblique lines of growth. The smaller valve suborbicular, carinated, concave; the umbo forming a small spiral of about one volution.

The foregoing description is a free translation of Professor Roemer's original description, and the three figures on Plate II are copies of his illustrations. The collection which Mr. Stolley sent to the Smithsonian from the region round about Austin, Tex., contained numerous examples of this species, but they have all suffered injury by pressure of the somewhat fragile shell. These specimens show that the species reached a considerably larger size than that which is indicated by Professor Roemer's figures; and also that the larger valve was usually, if not always, more or less distorted when fully grown. This species differs from *R. patagiata* in reaching usually a larger size, in having a less angular aspect, its test proportionally thinner, the spire of both valves less prominent, and in the peripheral angle being without a prominent fringe.

Other species which are probably referable to the section of the *Chamidæ* to which the shells herein described belong, are published by Roemer in his *Kreidebildungen von Texas*; but our collections do not at present contain any representatives of them. (Museum number, 12366.)



Genus *MONOPLEURA* Matheron.*MONOPLEURA MARCIDA* (sp. nov.).

[Plate III and Plate IV.];

Shell irregular; right valve deeply elongate, sometimes slender, more or less distorted, and usually a little twisted; rudely subelliptical in transverse section; the somewhat flattened anterior side and gently convex posterior side connected by a more abrupt rounding above and below. Scar of attachment sometimes large, occasionally extending along a large part of one side of the valve, but sometimes it is very small; ligamental groove extending from the apex to the hinge margin, distinct, linear, its presence made more conspicuous by the greater elevation of its posterior than of its anterior border. Left valve flat or gently convex; more or less straightened on the anterior side, and otherwise conforming to the margin of the right valve. Surface of the left valve marked by concentric lines of growth, and by numerous radiating irregular raised lines; that of the right valve marked by more or less strong lamellations and lines of growth, and by occasional longitudinal lines, similar to those which mark the other valve. Hinge moderately strong; the two teeth and hinge plate of the left valve strong and prominent, and the tooth of the right valve correspondingly prominent. The individuals sometimes grew separately, but often in clusters, attached to some foreign body or to each other.

The largest right valve in the collection has an extreme length of 50 millimeters, and its greatest diameter at the margin 22 millimeters. (Museum number, 12364.)

*MONOPLEURA PINGUISCULA* (sp. nov.).

(Plate V.)

Shell very irregular; right valve deep, capacious, often distorted, and sometimes more or less twisted; transverse section of the valve rudely subelliptical; scar of attachment sometimes large, but often small; ligamental groove linear, extending from the apex to the hinge margin, sometimes distinct and sometimes obscure, sometimes nearly straight, and sometimes irregular and oblique. Left valve more or less strongly convex, its umbonal portion being prominent and strongly incurved, and projecting beyond the hinge line. Test thick and strong in the dorsal portion and thin in the ventral. Surface of both valves having a plain aspect, but in the case of each it is marked by more or less distinct concentric lines and undulations of growth, with occasional faint traces of radiating lines, but the latter are never so distinct as they are upon the left valve of *M. marcida*. Hinge strong; the tooth of the right valve large and prominent, and those of the left valve supported upon a strong plate.

The longest right valve in the collection measures about 50 millime-

ters, but the shape and dimensions of the shell are so variable that it is impracticable to give any precise measurements.

Compared with the preceding species, with which it is associated, this species is more robust, has a smoother aspect, the left valve is much more prominent and convex. The right valve is proportionally more capacious, and never has that slender, rough, and angular aspect which that of the other species presents. The general aspect of this species, especially as regards its convex and curved left valve, is much like that of some species of *Caprotina*, but the character of the surface of both valves and that of the hinge seem to agree essentially with *Monopleura*. All the specimens in the collection appear to have grown separately, and not in clusters, as *M. marcida* often did. (Museum number, 12365.)

ON A SMALL COLLECTION OF MESOZOIC FOSSILS COLLECTED IN ALASKA BY MR. W. H. DALL, OF THE UNITED STATES COAST SURVEY.

---

During the years 1840-'42, Ilia Wosnessensky, while making zoological collections along the west coast of North America, obtained also a few fossils from Alaska. These were published by Constantine Grewingk, in *Verhandlungen der Russisch-Kaiserlichen Mineralogischen Gesellschaft zu St. Petersburg*, for the years 1848 and 1849, pp. 344-347. Those which Wosnessensky obtained from the Bay of Katmai, on the southern coast of Alaska, Grewingk referred to the Jurassic; and some others, from Kodiak Island, he referred to the Tertiary. In the work presently to be noticed, Eichwald, however, declares the former to be of Neocomian, and the latter of Turonian age.

Alaska and the Aleutian Islands were visited during the years 1847-'52, by Peter Doroschin, a Russian mining engineer, who made some important collections of Mesozoic fossil mollusks from various localities in that region. Professor Eichwald, in 1872, published these fossils in St. Petersburg, together with other fossils which Doroschin had collected in the region of the Caspian Sea, the title of the work being, "*Geognostisch-Palaeontologische Bemerkungen ueber die Halbinsel Mangischlak und die Aleutischen Insel.*" In that work, under the subtitle "*Fossile Thiere des Neocom und Gault,*" pages 158-200, he describes sixty-two species of Mesozoic fossil mollusks from Alaska and the Aleutian Islands, and devotes sixteen plates to their illustration. It is this portion of Doroschin's collection that I propose to more especially refer to in this article, because I have now to consider a small collection of fossils from Alaska which probably came from the same formation. Eichwald is positive in his reference of this part of Doroschin's collection mainly to the Neocomian division of the Cretaceous, but in part to the Gault. He identifies certain species found in Alaska with some of those which have been long known in Russian strata, and which Keyserling referred to the Jurassic. Geologists have generally accepted this reference; but in the work on Alaskan fossils just referred to, Eichwald states that the Russian strata which bear the fossils alluded to are of Neocomian, and not of Jurassic age. He also regards the Russian and Alaskan strata which bear those fossils respectively as geologically equivalent, and makes at least one Alaskan species identical with a Russian one.

Prof. Jules Marcou\* has called attention to the fact that there is a

---

\* *Explication d'une seconde edition de la Carte Géologique de la Terre*: by Jules Marcou; pp. 121 and 137-140.

commingling of Jurassic and Lower Cretaceous types in both the Russian and Alaskan strata which have just been referred to; and that a similar condition of things exists in the island of Saghalin, and other portions of Northern Asia.

The Mesozoic collections which were made by Doroschin in Alaska are very important, but Eichwald's publication gives no comprehensive sketch of the geology of the Alaskan region. He refers some of the fossils from Chasik Island to the Gault, and some to the Neocomian; but he gives no description of two separate Mesozoic formations there. For want of definite information as to the geology of the region one cannot feel certain that all the fossils which Eichwald refers to the Neocomian really came from one and the same formation. If those fossils are all strictly of the same epoch, I think Eichwald's reference of them to the Neocomian is not unreasonable, because so many of those mollusks are of Cretaceous types; and yet Marcou's statement that there is a commingling of Jurassic and Neocomian types in those northern Mesozoic strata seems to be well supported. It has been thought by some paleontologists that *Aucella* is confined to Jurassic strata; but this genus is now known to exist in strata of undoubted Cretaceous age; and if the opinion of Eichwald is accepted, it will appear that *Aucella* is more characteristic of the Cretaceous than of Jurassic strata. At least it is plain that we cannot now rely upon the presence of that genus as affording any proof of the Jurassic age of the strata which contains it.

During the prosecution of his work upon the United States Coast and Geodetic Survey along the western coast of the Alaskan Peninsula in the year 1874, Mr. W. H. Dall made a collection of Mesozoic invertebrate fossils which are of the same age as, at least a part of, those which were collected by Doroschin. In his notes, Mr. Dall designates the locality at which they were discovered, as "Fossil Point, Fort Möller"; and indicates its position as approximately in longitude  $160^{\circ} 31'$  west; and latitude  $45^{\circ} 14'$  north. The collection consists mainly of a species of *Aucella*, which is evidently identical with the forms which are figured on Eichwald's Plate XVII (*loc. cit.*); the specimens of which collection, like those of Doroschin's, are all in the condition of natural casts. The collection also contains a single valve of a species of *Cyprina*, and some fragments of a remarkably slender Belemnite. This collection is now the property of the United States National Museum; and permission to use it in the preparation of this article has been given by the Director of the Museum.

Two years previous to Mr. Dall's labors in Alaska, the same region was visited by M. Alph.-L. Pinart, who obtained some fossil shells of Mesozoic age upon the eastern side of the Alaskan peninsula. These fossils evidently came from the same formation that furnished the shells which are figured by Eichwald on his Plate XVII. M. Pinart, in his report, entitled "*Voyages a la cote Nord-Ouest de l'Amerique*," design-

nates the two localities from which the fossils just mentioned were obtained, as "le baie d'Amakshak, pres Soutkhoun; et le baie de Nak-khalilik, pres du volcan Chighinagak." The former locality is approximately in latitude  $56^{\circ} 50'$ ; longitude  $159^{\circ} 40'$  west; and the latter, in latitude  $56^{\circ} 58'$ ; longitude  $159^{\circ} 10'$  west.

The fossils which were collected by M. Pinart were discussed by M. P. Fischer, in the report just cited, under the subtitle, "Sur quelques Fossiles de l'Alaska," pages 33-36, Plate A. Only two species were obtained by Pinart from the localities just mentioned, one of which Fischer places under *Pholadomya* (*Homomya*), but he gives it no specific name. The other he refers to the *Aucella concentrica* of Fischer.

I am in some doubt as to whether Dall and Pinart collected from the same locality in any case, but I think it probable that Dall's locality on the western side of the Alaskan peninsula, and Pinart's localities on the eastern side, had all been previously visited by Doroschin. It is quite evident, however, that the strata from which they respectively collected specimens of *Aucella* all belong to one and the same horizon. If the Mesozoic collections of Dall and Pinart, and also that part of Doroschin's collection which Eichwald refers to the Neocomian, all really came from one and the same formation, the fauna thus represented has certainly much of Cretaceous, as well as of Jurassic character. This is true, even after excluding those species of Doroschin's collection which Eichwald refers to the Gault, and of course all that he refers to the Turoonian. Still, this fauna has enough of Jurassic character, according to the views which have hitherto been generally entertained by paleontologists, to suggest that the strata which bear it occupy a transitional position, as indicated by Marcou. According to views now generally held by naturalists, transitional faunas ought to occur between all those which especially characterize each epoch respectively, and the suggestion of such a case for this Alaskan fauna seems to me to be reasonable.

Certain of the Cretaceous strata of Texas have been doubtfully referred to the Neocomian, but with this exception, no North American strata south of the northern limit of the United States have hitherto been referred to the lower division of the Cretaceous series, and a broad hiatus has appeared to exist between those northern strata and the lowest of the Cretaceous rocks yet known south of the limit just referred to. Within a few years past, however, the labors of Dr. George M. Dawson in the coast region of British Columbia, have brought to light some series of fossils which Mr. Whiteaves thinks prove the strata carrying them to be of the age of the Middle Cretaceous, and the upper part of the Neocomian. (See Trans. Roy. Soc. Canada, Sec. IV, 1882, p. 81.) Lately also, some Ammonites have been sent to the United States National Museum by Mr. James G. Swan, from Skonum Point, British Columbia, which are suggestive of the earliest Cretaceous, if not of Jurassic age, and they will doubtless be found to hold an important relation to the Cretaceous strata examined by Dr. Dawson, and

also to the Alaskan Mesozoic strata which bear the fossils described in this article. In fact, it seems now to be evident that it is along the west coast of North America, from California to Alaska, that we are to look for the lower portion of the Cretaceous series on this continent. While these northwestern strata seem to be certainly older than the oldest of the Cretaceous strata in all that broad region occupied by Dakota, Montana, Wyoming, Colorado, and Utah, it is nevertheless true that in all that great region, where the Cretaceous and Jurassic strata are both exposed, the former seems always to rest conformably upon the latter. This apparent conformability over so wide a region shows how cautious one ought to be in concluding that deposition has been continuous in all cases where there is perfect conformity of strata, even if it is of great extent.

A consideration of these Alaskan fossils would be much more interesting if we had a satisfactory knowledge of the stratigraphical geology of the region from which they were obtained. A sketch of the geology of the Alaskan Peninsula, which, although brief, is the best with which I am acquainted, is given by Mr. Dall in the American Journal of Science for July, 1882, pp. 67 and 68. This sketch shows the relations of the rock-formations of that peninsula to each other; and one may obtain from it also an indication of the formation from which the fossils described in this article were obtained.

## MOLLUSCA.

Genus AUCELLA Keyserling.

AUCELLA CONCENTRICA Fischer (variety).

(Plate VI, Figs. 2-12.)

The different species of *Aucella* which have been recognized and published by various authors present so few salient characteristics which distinguish them from each other that, excepting a consideration of their general or average shape, a detailed description of any of them is necessarily hardly anything more than a repetition of generic characters. Such would certainly be the case in attempting to diagnose the form now under consideration. This form also varies so much in shape that an attempt to compare it with other published forms in that respect is also unsatisfactory. I therefore omit descriptive details, and give numerous figures, which illustrate some of the extreme shapes which this Alaskan shell assumes. The specimens which are figured on Plate VI are selected from the Alaskan collection of Mr. Dall, which has already been mentioned. A glance at these figures will show that they present almost as great a degree of variation among themselves as is usually found among the illustrations of the different species of *Aucella* which have hitherto been published by different

authors. If, for example, the specimens which are represented by Figs. 2 and 3, and 9 and 10, respectively, had been found alone and at different localities, I think few paleontologists would have hesitated to publish them as different species. The specimens are all in the condition of natural casts and molds, and therefore all the surface characteristics of the species are not shown. Fig. 12 is drawn from a gutta-percha cast, taken from a natural mold of part of a shell, and shows the strong, sharp, concentric ridges which marked the surface of the test. (The Museum record number of the type specimens is 12360.)

The numerous specimens of this collection show such a gradation of form among themselves that I cannot doubt that they are all properly referable to one and the same species. Comparing these specimens also with the figures of Alaskan forms of *Aucella* which are given by M. Fischer on his Plate A, and also with those given by Eichwald on Plate XVII (loc. cit.), I cannot doubt that they are all specifically identical with each other, nor that they all represent only one species. I have, however, some doubt as to which of the known European species of *Aucella* the Alaskan form ought to be referred to; but as it seems to agree more nearly with *A. concentrica* Fischer, I have designated it as a variety of that species.

Genus CYPRINA Lamarck.

CYPRINA? DALLII (sp. nov.).

(Plate VI, Fig. 1.)

Shell moderately large, and having the usual external aspect of *Cyprina*, as is shown by the figure on Plate VI.

The collection made by Mr. Dall contains only a single example of this form, and that is in the condition of a natural cast of the right valve. It is therefore too imperfect for satisfactory specific diagnosis, and it is named only for convenience in any future discussion of the fauna of which it forms a part. (The Museum catalogue number is 12362.)

Genus BELEMNITES Lamarck.

BELEMNITES MACRITATIS (sp. nov.).

(Plate VI, Figs. 13 and 14.)

The collection made by Mr. Dall contains some imperfect specimens of a remarkably slender Belemnite, imbedded in fragments of hard sandstone, together with some natural molds of a couple of more perfect examples. They are very slender, and taper gradually to a blunt point at the distal end. The extreme proximal end is unknown.

The very slender form of this species at first led me to suppose it to

be a species of the Pennatulid genus *Graphularia* of Edwards & Haime. It has, however, not only the usual radiate and concentric structure of *Belemnites*, but one of the examples shows plainly the cavity of the phragmocone, with a small bulb-cavity at its point. Another example shows a faint longitudinal groove along one side, such as is common in both *Belemnites* and *Belemnitella*. (Museum catalogue number, 12361.)

Dr. Eichwald, in the work already cited, describes three species of *Belemnites* from Chasik Island, and one from the Alaskan Peninsula; but the species here described differs materially from all of them in its small size and very slender form.



ON THE NAUTILOID GENUS ENCLIMATOCERAS HYATT,  
AND A DESCRIPTION OF THE TYPE SPECIES.

In the year 1880 Mr. E. O. Ulrich sent to the Smithsonian Institution a small collection of fossils which he had obtained from the Cretaceous strata near Little Rock, Ark. A part of these fossils were described by me in Vols. III and IV of Proceedings of the United States National Museum; but the Nautiloid shell now described was then only casually noticed. Its peculiarities were recognized at that time, and the specimens were laid aside with the hope that better material might be procured for study. Other specimens belonging to this or a closely related species were afterward collected by Mr. Lawrence O. Johnson from strata supposed to be of Cretaceous age, in Wilcox County, Alabama, but they are no more perfectly preserved than the Arkansas specimens.

Prof. Alpheus Hyatt having had in hand an exhaustive work on *Nautilus* and its allies, the Arkansas specimens were placed with him for examination. In a preliminary work of his, just published, he divides the genus *Nautilus* as it has been generally recognized, into numerous genera besides those previously proposed by other authors. To one of these groups he has given the generic name *Enclimatoceras*, and made the species here described the type of the genus. The following is his generic diagnosis, which he has also published in the Proceedings of the Boston Society of Natural History, Vol. XXII, 1884, p. 270.

Genus ENCLIMATOCERAS Hyatt.

"*Enclimatoceras* includes species of the Trias to the Tertiary, inclusive, which are connected by the outlines of their sutures. The whorls are involute from an early stage, and compressed. The abdomens are rounded, but become acute in many species. The sutures have prominent ventral saddles, flattened in species with rounded abdomens, and acute in those with acute abdomens; never divided by ventral lobes. The lateral lobes are deep, and the lateral saddles well marked. The ventral saddles in the young are broad, and closely resemble the ventrals of the *Hercoglossæ*, as do also the broad lateral saddles of the later larval stages in some species. There are no annular lobes at any stage in the Triassic, according to Mojsisovics. They do not seem to be present in some of the Jurassic and Cretaceous species, at least during the early stages, and are very small in some adults. The Triassic species are nearly related to *Grupoceras*, according to Mojsisovics' figures and descriptions in 'Das Gebirge um Hallstatt.' The siphon in this type is a little below the center in the young, though ventral in the adult; and this also agrees with the characteristics of *Enclimatoceras styriacus*, sp.

Mojsisovics, of the Trias, and *Grupoceras*. Nevertheless there is no ventral lobe at any stage; the annular lobe is absent in the Triassic forms, and young of later forms; and the siphon in two species is short-funneled, with connective walls, or ellipchoanoidal. Type, *Enclim. (Nautil.) ulrichi* White."

ENCLIMATOCERAS (NAUTILUS) ULRICHI White.

(Plates VII, VIII, and IX.)

Shell moderately large; somewhat narrowly but regularly rounded upon the periphery in the adult state, and broadly rounded at the sides; whorls almost completely involute, the umbilici being very small; septa somewhat deeply concave; ventral saddles large, prominent, and regularly rounded; lateral lobes broad and moderately deep; lateral saddles prominent and narrow, and rounded at the outer end, and also becoming laterally prominent in the later formed septa of adult shells. The character of the surface is unknown, but it was apparently plain; and the test was moderately thin. In the young state the shell was more globose in form, and the septa were much less deeply lobed.

All the specimens which have yet come under my observation are in the condition of natural casts, and all are imperfect. The best one of these specimens is figured on Plates VII, VIII, and IX, together with a fragment showing the inner volutions. The outlines which are added to the figures represent the supposed outline of the aperture of the adult shell.

The diameter of the coil of the type specimen, when perfect, was apparently about 180 millimeters; the greatest transverse diameter about 125 millimeters. Some of the specimens already referred to, which were collected in Alabama by Mr. Johnson, indicate a considerably larger size.

In Vol. I of the Transactions of the Saint Louis Academy of Science Dr. Shumard described a form under the name of *Nautilus texanus*, but which he did not figure. Judging from his description, it seems to agree with the form here described, except for the material difference that it is marked by numerous flexuous transverse ribs, while the surface of our form is evidently plain. The difference between *E. ulrichi* and most of the other Cretaceous Nautiloid shells of the United States has now been made generic by Professor Hyatt, and specific comparisons are therefore unnecessary. The collection sent by Mr. Ulrich to the Smithsonian, containing the type specimens of this species, also contains representatives of numerous other species, but all of them, like these types, are imperfect. Among them are *Callianassa ulrichi* White, *Tubulosteuum dickhauti* White, *Gryphaea pitcheri* Morton?, *Turritella*, *Anchura*, *Axinæa*, *Oncullæa*, &c.

The type specimens bear the Museum catalogue number 8349; and permission to use them in the preparation of this article has been given by the Director of the Museum.

(105)



# INDEX.

|                                                                    | Page   |
|--------------------------------------------------------------------|--------|
| Alaskan fossils, discussion of.....                                | 10     |
| <i>Aucella concentrica</i> .....                                   | 13     |
| <i>Belemnites macritatis</i> .....                                 | 14     |
| <i>Chamidas</i> , aberrant forms of.....                           | 5      |
| Cretaceous fossils of Texas .....                                  | 5      |
| Cretaceous fossils of Arkansas .....                               | 16     |
| <i>Cyprina?</i> <i>dallii</i> .....                                | 14     |
| Dall, W. H., Alaskan fossils collected by.....                     | 10, 11 |
| Dawson, Dr. George M., labors in British Columbia referred to..... | 12     |
| Doroshin, Peter, Alaskan fossils collected by.....                 | 10     |
| Eichwald, Prof. Edward von; publication of Alaskan fossils .....   | 10     |
| <i>Enclimatoceras</i> of Hyatt, generic diagnosis of.....          | 16     |
| <i>Enclimatoceras ulrichi</i> .....                                | 17     |
| Fischer, P., on Alaskan fossils .....                              | 12     |
| Grewingk, Constantine, publication of Alaskan fossils.....         | 10     |
| Hyatt, Prof. Alphens, on the genus <i>Enclimatoceras</i> .....     | 16     |
| Marcon, Prof. Jules, work cited.....                               | 10     |
| <i>Monopleura marcida</i> .....                                    | 8      |
| <i>Monopleura pinguiscula</i> .....                                | 8      |
| Pinart, A. L., collection of Alaskan fossils by .....              | 11     |
| <i>Requienia patagiata</i> .....                                   | 6      |
| <i>Requienia texana</i> .....                                      | 7      |
| Roemer, Prof. Ferdinand, work cited.....                           | 7      |
| Stolley, George, collection of Texas fossils by .....              | 6      |
| Swan, J. G., collection of fossils by, in British Columbia.....    | 12     |
| Texas fossils, discussion of .....                                 | 5      |
| Ulrich, E. O., collection of Arkansas fossils by.....              | 16     |
| Whiteaves, J. F., on Cretaceous fossils of British Columbia .....  | 12     |
| Wosnessensky, Iliia, collection of Alaskan fossils by .....        | 10     |

### EXPLANATION OF PLATES.

---

#### PLATE I.

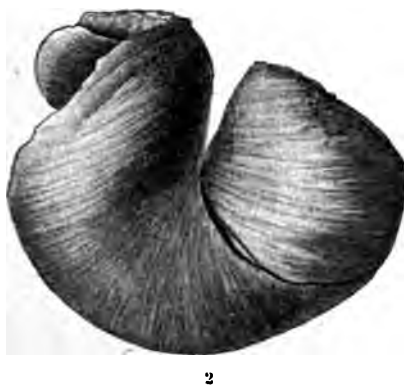
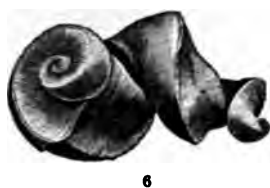
REQUIENIA PATAGIATA. (Page 6.)

FIGS. 1, 2, 3.—Three different views of one of the largest of the type specimens; both valves together.

FIGS. 4, 5.—Two views of a smaller example.

FIGS. 6, 7.—Two views of another example, showing the two valves partly separated.

FIG. 8.—A portion of a left valve, showing the hinge. All of natural size. For other figures of this species see Plate II.



REQUIENIA PATAGIATA.



• • •

.

.

.

.

.

.

.

.

.

.





## PLATE II.

## REQUIENIA PATAGIATA. (Page 6.)

FIGS. 1, 2.—Two views of a small example ; both valves together.

FIG. 3.—Upper view of a large and somewhat distorted example.

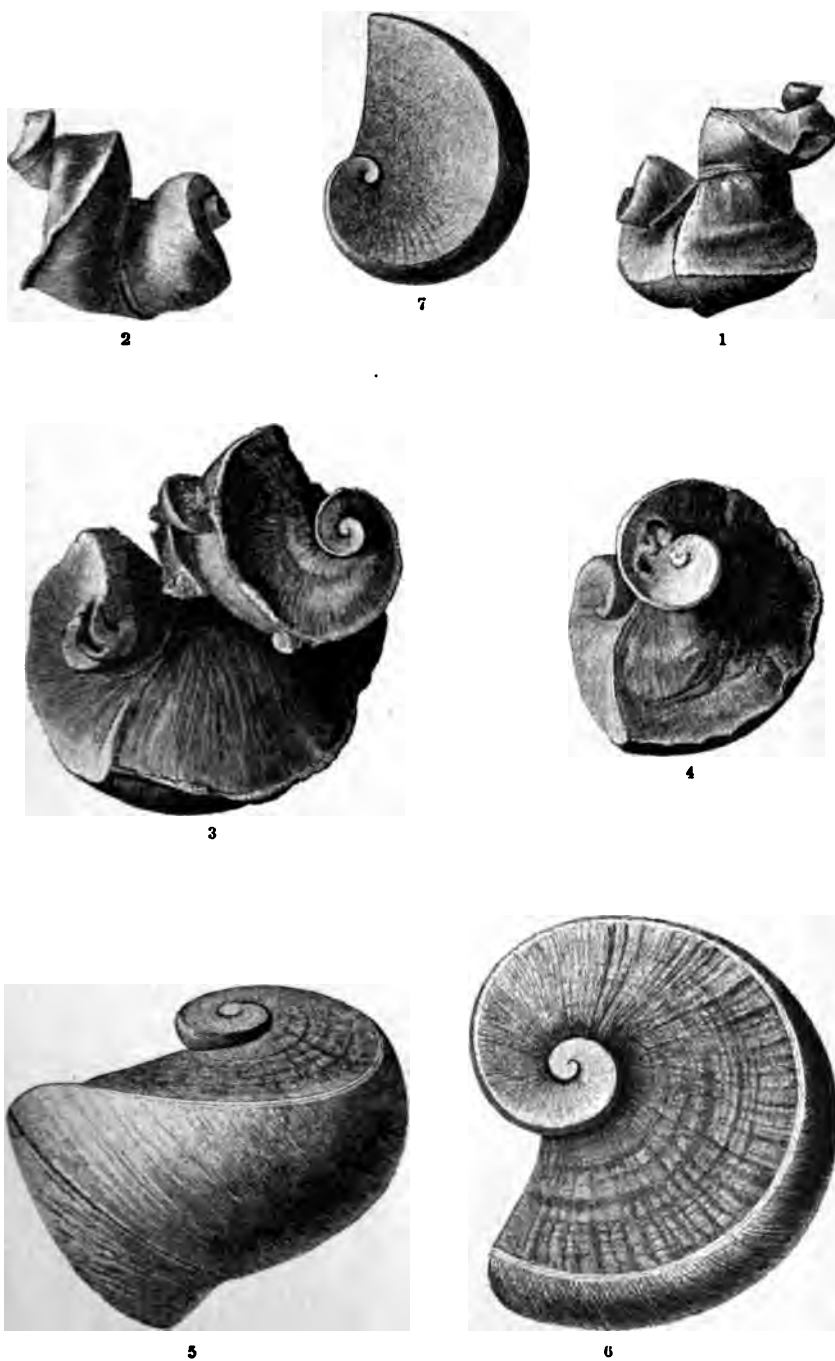
FIG. 4.—A similar view of a smaller distorted example. All of natural size. For other figures of this species see Plate I.

## REQUIENIA TEXANA. (Page 7.)

FIG. 5.—Lateral view ; the two valves together.

FIG. 6.—Upper view of the left valve.

FIG. 7.—Similar view of the right valve. Figures 5, 6, and 7 are after Roemer ; all of natural size.



**REQUIENIA PATAGIATA—REQUIENIA TEXANA.**





## PLATE III.

## MONOPLEURA MARCIDA. (Page 8.)

- FIGS. 1, 2.—Opposite lateral views of a cluster of individuals, the larger ones being attached to a left valve of another example.
- FIG. 3.—An upper view of the same example, showing the hinge of the largest right valve, and the left valves of the other members of the cluster in situ.
- FIG. 4.—Inner surface of the left valve which forms the base of the cluster represented by Figs. 1, 2, and 3.
- FIG. 5.—A separate example, showing both valves.
- FIG. 6.—Another example, also showing both valves.
- FIG. 7.—A right valve, showing the slender ligamental groove.
- FIG. 8.—Another slender right valve, also showing the groove.
- FIG. 9.—Interior view of the same example, showing the hinge.
- FIG. 10.—A similar view of the hinge of another example, which is attached to a right valve of *Requienia patagiata*. All are of natural size. For other examples see Plate IV.



MONOPLEURA MARCIDA.

[REDACTED]





## PLATE IV.

## MONOPLEURA MARCIDA. (Page 8.)

- FIG. 1.—Lateral view; the right valve attached to a foreign body, and the left valve bearing two young examples of *Requienia patagata*.  
FIG. 2.—Lateral view of another example, the left valve bearing a young *Requienia*.  
FIG. 3.—A similar view of another example, which also shows both valves.  
FIGS. 4, 5.—Opposite views of a large distorted example; both valves together.  
FIGS. 6, 7.—Opposite views of another example, also showing both valves.  
FIGS. 8, 9.—Opposite views of a cluster of very young individuals attached to a corallite of *Cladophyllia*. All are of natural size. For other examples of this species see Plate III.



7



9



6



8



3



2



1



4



5

MONOPLEURA MARCIDA.





.

.

.

## PLATE V.

## MONOPLEURA PINGUISCULA. (Page 8.)

FIGS. 1, 2.—Opposite views of a large example, showing both valves.

FIGS. 3, 4.—Opposite views of a distorted example, showing both valves.

FIG. 5.—Another example; the right valve much elongated.

FIG. 6.—Another example; the right valve much distorted.

FIG. 7.—Another example, showing the hinge-plate of the broken left valve.

FIG. 8.—A right valve, showing the hinge. All natural size.



1



2



3



4



5



6



7



8

MONOPLEURA PINGUISCULA.







## PLATE VI.

## CYPRINA ? DALLII. (Page 14.)

FIG. 1.—Lateral view of a natural cast of the interior of a right valve.

## AUCELLA CONCENTRICA var. (Page 13.)

FIGS. 2, 3.—Two views of an internal cast of an adult example of normal shape.

FIGS. 4, 5.—Two views of another example, of smaller size.

FIGS. 6, 7.—Two views of still another similar example.

FIG. 8.—View of a left valve of one of the largest examples.

FIGS. 9, 10.—Two views of an unusually short and inflated example.

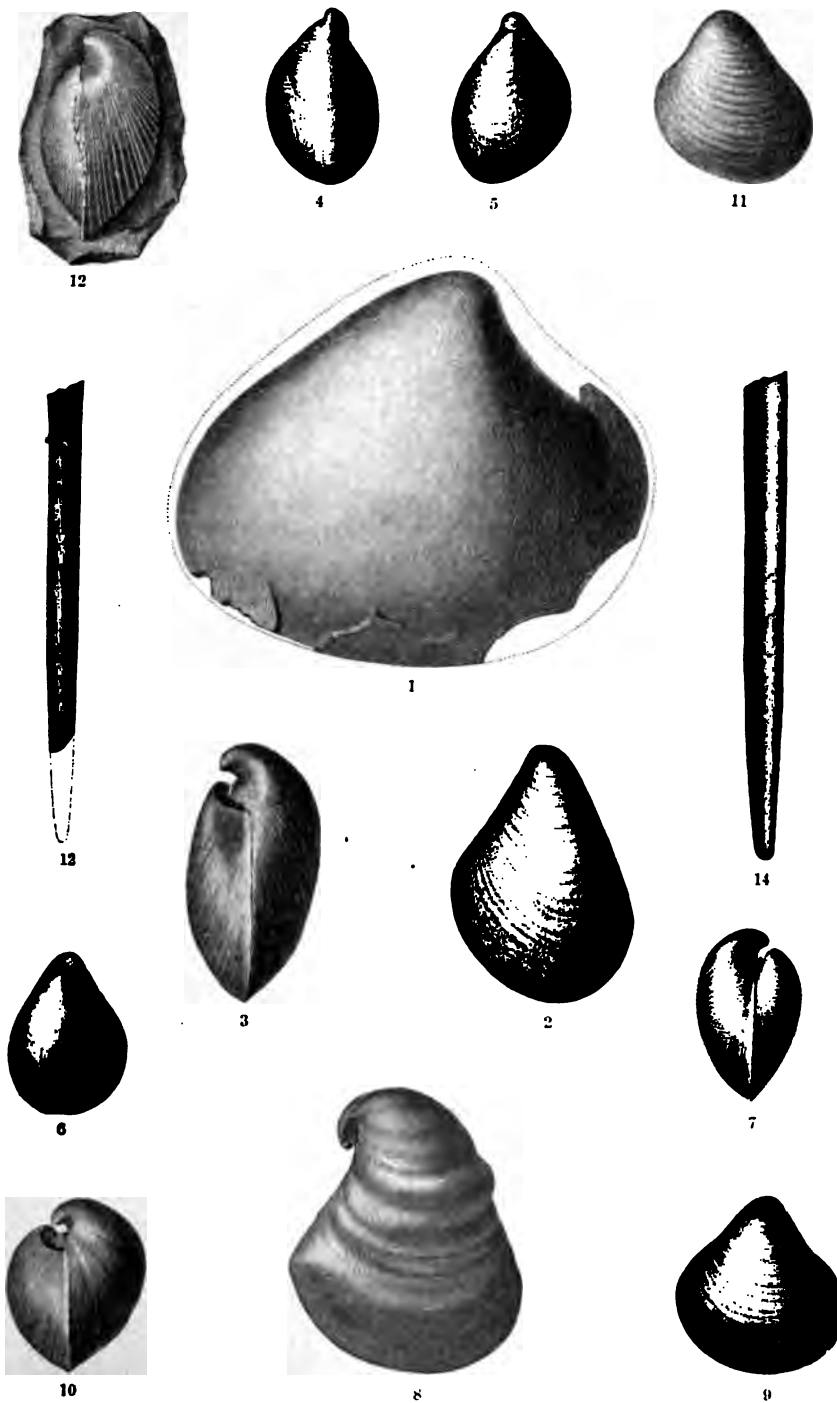
FIG. 11.—The left valve of another short example.

FIG. 12.—View of a gutta-percha cast from a natural mold of part of a shell, showing the concentric lamellations of the test. All of natural size.

## BELEMNITES MACRITATIS. (Page 14.)

FIG. 13.—A fragment, showing the terminal portion of the phragmocone.

FIG. 14.—View of a gutta-percha cast of a natural mold. All of natural size.



*CYPRINA ? DALLII*, *AUCELLA CONCENTRICA* var., and *BELEMNITES MACRITATIS*.



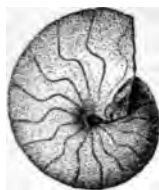


## PLATE VII.

ENCLIMATOCERAS ULRICHI. (Page 17.)

FIG. 1.—Lateral view of the type specimen, four-fifths natural size.

FIGS. 2, 3.—Two views of a fragment, showing the inner volutions. For other figures see Plates VIII and IX.



2



3



1

ENCLIMATOCERAS ULRICHI.



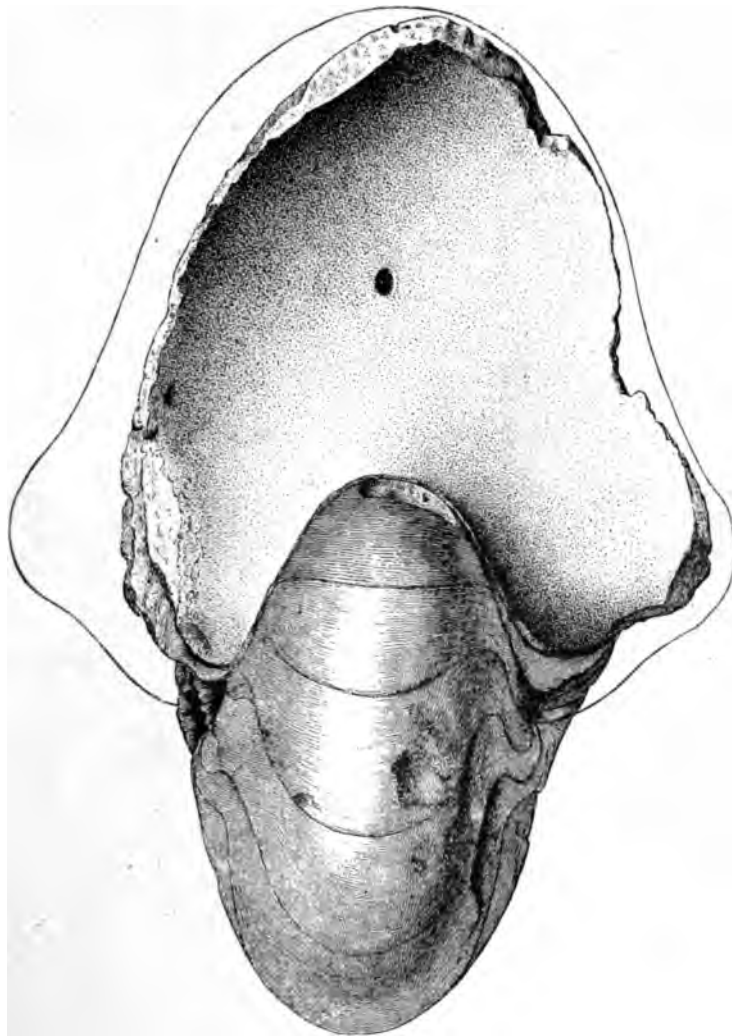




## PLATE VIII.

ENCLIMATOCERAS ULRICHI. (Page 17.)

Front view of the type specimen, four-fifths natural size. For other figures see  
Plates VII and IX.



EXCLIMATOCERAS ULRICHI.

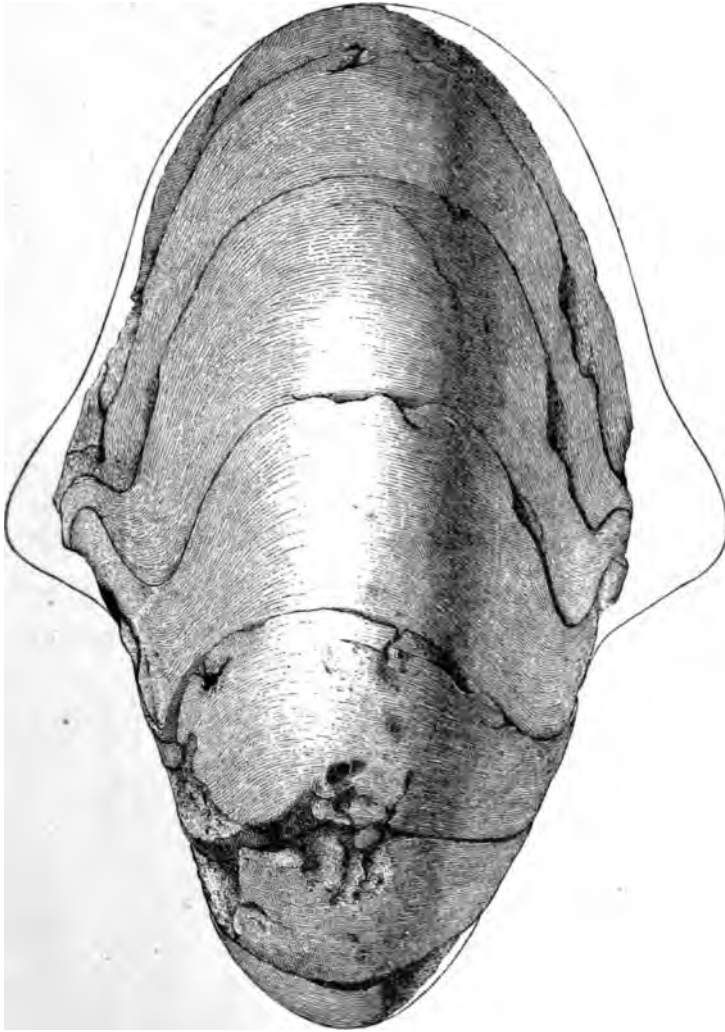
[REDACTED]



●  
PLATE IX.

ENCLIMATOCERAS ULRICHI. (Page 17.)

Peripheral view of the type specimen, four-fifths natural size. For other figures see  
Plates VII and VIII.



**ENCLIMATOCERAS ULRICH.**



## ADVERTISEMENT.

(Bulletin 5.)

The publications of the United States Geological Survey are issued in accordance with the statute, approved March 3, 1879, which declares that—

“The publications of the Geological Survey shall consist of the annual report of operations, geological and economic maps illustrating the resources and classifications of the lands, and reports upon general and economic geology and paleontology. The annual report of operations of the Geological Survey shall accompany the annual report of the Secretary of the Interior. All special memoirs and reports of said Survey shall be issued in uniform quarto series if deemed necessary by the Director, but otherwise in ordinary octavos. Three thousand copies of each shall be published for scientific exchanges and for sale at the price of publication; and all literary and cartographic materials received in exchange shall be the property of the United States and form a part of the library of the organization. And the money resulting from the sale of such publications shall be covered into the Treasury of the United States.”

### ANNUAL REPORTS.

From the above it will be seen that only the Annual Reports, which form parts of the reports of the Secretary of the Interior and are printed as executive documents, are available for gratuitous distribution. A number of these are furnished the Survey for its exchange list, but the bulk of them are supplied directly, through the document rooms of Congress, to members of the Senate and House. Except, therefore, in those cases in which an extra number is supplied to this office by special resolution, application must be made to members of Congress for the Annual Reports, as for all other executive documents.

Of these Annuals there have been already published:

I. First Annual Report to the Hon. Carl Schurz, by Clarence King. 1880. 8°. 79 pp. 1 map.—A preliminary report describing plan of organization and publications.

II. Report of the Director of the United States Geological Survey for 1880-'81, by J. W. Powell. 1882. 8°. 1v, 588 pp. 61 pl. 1 map.

III. Third Annual Report of the United States Geological Survey, 1881-'82, by J. W. Powell. 1883. 8°. xviii, 564 pp. 67 pl. and maps.

IV. Fourth Annual Report of the United States Geological Survey, 1882-'83, by J. W. Powell. 1884. 8°. xii, 473 pp. 85 pl. and maps.

No copies of the Fourth Annual have as yet been ordered by Congress for distribution by the Geological Survey.

### MONOGRAPHS.

The Monographs of the Survey are printed for the Survey alone, and can be distributed by it only through a fair exchange for books needed in its library, or through the sale of those copies over and above the number needed for such exchange. They are not for gratuitous distribution.

So far as already determined upon, the list of these Monographs is as follows:

I. The Precious Metals, by Clarence King. In preparation.

II. Tertiary History of the Grand Cañon District, with atlas, by Capt. C. E. Dutton. Published.

III. Geology of the Comstock Lode and Washoe District, with atlas, by George F. Becker. Published.

IV. Comstock Mining and Miners, by Elliot Lord. In press.

V. Copper-bearing Rocks of Lake Superior, by Prof. R. D. Irving. In press.

VI. Older Mesozoic Flora of Virginia, by Prof. William M. Fontaine. In press.

VII. Silver-lead Deposits of Eureka, Nevada, by Joseph S. Curtis. In press.

VIII. Paleontology of the Eureka District, Nevada, by Charles D. Walcott. In press.

Geology and Mining Industry of Leadville, with atlas, by S. F. Emmons. In preparation.

Geology of the Eureka Mining District, Nevada, with atlas, by Arnold Hague. In preparation.

Coal of the United States, by Prof. R. Pumpelly. In preparation.

Iron in the United States, by Prof. R. Pumpelly. In preparation.

Lesser Metals and General Mining Resources, by Prof. R. Pumpelly. In preparation.

Lake Bonneville, by G. K. Gilbert. In preparation.

Dinocerata. A monograph on an extinct order of Ungulates, by Prof. O. C. Marsh. In press.

Sauropoda, by Prof. O. C. Marsh. In preparation.

Stegosauria, by Prof. O. C. Marsh. In preparation.

Of these Monographs, Nos. II, III, and IV are now published, viz:



## ADVERTISEMENT.

II. Tertiary History of the Grand Cañon District, with atlas, by C. E. Dutton, Capt. U. S. A. 1882 4°. 264 pp., 42 pl. and atlas of 26 double sheets folio. Price \$10.12.

III. Geology of the Comstock Lode and Washoe District, with atlas, by George F. Becker. 1882. 4°. 422 pp. 7 pl. and atlas of 21 sheets folio. Price \$11.

IV. Comstock Mining and Miners, by Eliot Lord. 1883. 4°. 451 pp. 3 pl. Price \$1.50.

Nos. V, VI, VII, and VIII are in press and will appear in quick succession. The others, to which numbers are not assigned, are in preparation.

## BULLETINS.

The Bulletins of the Survey will contain such papers relating to the general purpose of its work as do not properly come under the heads of ANNUAL REPORTS or MONOGRAPHS.

Each of these Bulletins will contain but one paper and be complete in itself. They will, however, be numbered in a continuous series, and will in time be united into volumes of convenient size. To facilitate this each Bulletin will have two paginations, one proper to itself and another which belongs to it as part of the volume.

Of this series of Bulletins, Nos. 1, 2, 3, 4, and 5 are already published, viz:

1. On Hypersthene-Andesite and on Triclinic Pyroxene in Augitic Rocks, by Whitman Cross, with a Geological Sketch of Buffalo Peaks, Colorado, by S. F. Emmons. 1883. 8°. 42 pp. 2 pl. Price 10 cents.

2. Gold and Silver Conversion Tables, giving the coining value of Troy ounces of fine metal, &c., by Albert Williams, jr. 1883. 8°. 8 pp. Price 5 cents.

3. On the Fossil Faunas of the Upper Devonian, along the meridian of 76° 30', from Tompkins County, New York, to Bradford County, Pennsylvania, by Henry S. Williams. 1884. 8°. 31 pp. Price 5 cents.

4. On Mesozoic Fossils, by Charles A. White. 1884. 8°. 36 pp. 9 pl. Price 5 cents.

5. A Dictionary of Altitudes in the United States, by Henry Gannett. 1884. 8°. 325 pp. Price 20 cents.

Nos. 6 and 7 are in press.

## STATISTICAL PAPERS.

A fourth series of publications having special reference to the mineral resources of the United States is contemplated. Of that series the first has been published, viz: Mineral Resources of the United States, by Albert Williams, jr. 1883. 8°. xvii, 813 pp. Price 50 cents.

Correspondence relating to the publications of the Survey, and all remittances—which must be by postal note or money order—should be addressed to the

DIRECTOR OF THE UNITED STATES GEOLOGICAL SURVEY,  
Washington, D. C.

WASHINGTON, D. C., June 20, 1884.

DEPARTMENT OF THE INTERIOR

---

BULLETIN

573610

OF THE

UNITED STATES

**GEOLOGICAL SURVEY**

No. 5



WASHINGTON

GOVERNMENT PRINTING OFFICE

1884



UNITED STATES GEOLOGICAL SURVEY  
J. W. POWELL DIRECTOR

---

A

# DICTIONARY OF ALTITUDES

IN

THE UNITED STATES

COMPILED BY

HENRY GANNETT  
CHIEF GEOGRAPHER



WASHINGTON  
GOVERNMENT PRINTING OFFICE  
1884



## LETTER OF TRANSMITAL.

DEPARTMENT OF THE INTERIOR,  
UNITED STATES GEOLOGICAL SURVEY,  
*Washington, D. C., November 1, 1883.*

SIR: I have the honor to transmit herewith the manuscript of a Dictionary of Altitudes. The work of making a compilation of measurements of altitude was commenced by me under the auspices of the Geological Survey of the Territories, by which organization three different editions of the results were published, under the title of "Lists of Elevations," in the years 1873, 1875, and 1877, respectively. These earlier editions related principally to that portion of the country west of the Mississippi River. The present work embraces within its scope the whole country. The elevations are tabulated by States and Territories, alphabetic arrangement being observed throughout.

Very respectfully, yours,

HENRY GANNETT,  
*Chief Geographer.*

HON. J. W. POWELL,  
*Director United States Geological Survey.*



# CONTENTS.

---

|                                          | Page |
|------------------------------------------|------|
| Letter of transmittal .....              | 5    |
| Table of contents .....                  | 7    |
| Discussion of authorities.....           | 9    |
| Abbreviations of names of railroads..... | 17   |
| <b>Tables:</b>                           |      |
| Alabama .....                            | 25   |
| Alaska .....                             | 29   |
| Arizona .....                            | 30   |
| Arkansas.....                            | 35   |
| California .....                         | 37   |
| Colorado.....                            | 55   |
| Connecticut .....                        | 71   |
| Dakota .....                             | 73   |
| Delaware .....                           | 76   |
| District of Columbia .....               | 77   |
| Florida .....                            | 78   |
| Georgia .....                            | 79   |
| Idaho .....                              | 84   |
| Illinois .....                           | 87   |
| Indiana.....                             | 95   |
| Indian Territory .....                   | 104  |
| Iowa .....                               | 105  |
| Kansas .....                             | 113  |
| Kentucky.....                            | 120  |
| Louisiana .....                          | 125  |
| Maine .....                              | 126  |
| Maryland .....                           | 129  |
| Massachusetts .....                      | 133  |
| Michigan .....                           | 138  |
| Minnesota .....                          | 147  |
| Mississippi .....                        | 155  |
| Missouri .....                           | 157  |
| Montana .....                            | 165  |
| Nebraska .....                           | 169  |
| Nevada .....                             | 173  |
| New Hampshire .....                      | 182  |
| New Jersey .....                         | 187  |
| New Mexico .....                         | 192  |
| New York.....                            | 203  |
| North Carolina.....                      | 223  |
| Ohio.....                                | 227  |
| Oregon .....                             | 241  |
| Pennsylvania .....                       | 245  |
| Rhode Island .....                       | 275  |
| South Carolina.....                      | 276  |



| Tables—Continued.   | Page. |
|---------------------|-------|
| Tennessee .....     | 279   |
| Texas .....         | 283   |
| Utah .....          | 290   |
| Vermont .....       | 301   |
| Virginia .....      | 304   |
| Washington .....    | 312   |
| West Virginia ..... | 314   |
| Wisconsin .....     | 317   |
| Wyoming .....       | 321   |

## **DISCUSSION OF AUTHORITIES.**

### **ADIRONDACK SURVEY (ADIR. SURVEY), OF NEW YORK.**

Most of these determinations are barometric. Some, however, have been determined by trigonometric methods and some by level.

### **APPALACHIAN CLUB (APPAL. CLUB).**

Most of the determinations credited to this source are barometric, or at least depend upon barometric bases.

### **CITY ENGINEER.**

These figures are the results of levelings courteously furnished me by the city engineers of the principal railway centers of the country.

### **DALL, WM. H., ASST. U. S. C. AND G. S.**

Heights derived from this source were determined by angles measured with the sextant, from a base line measured by means of sextant latitudes and chronometric longitudes, from observations taken on board ship. (*Vide* Coast Survey Report for 1875.)

### **DE LACY, W. W.**

All heights were measured by aneroid.

### **EASTMAN.**

These results are from barometric work and from observations upon the boiling point of water.

### **EMORY, W. H.**

Barometric determinations abstracted from a "Report of Explorations from Fort Leavenworth to San Diego," 1846. [30th Congress, 1st session, Senate Document.]

### **FOSTER AND WHITNEY.**

Barometric determinations from the report on Lake Superior mining region.

### **FRÉMONT, CAPT. J. C.**

Barometric determinations from reports of various expeditions in the West. Owing to the want of a barometric base, they are, in general, of poor quality.

### **GARDINER, J. T.**

The heights credited to this authority were deduced from railroad levels, and were published in the report of the United States Geological Survey of the Territories for the year 1873.

## GEOLOGICAL SURVEY OF MAINE.

Most of these results are barometric.

## GEOLOGICAL SURVEY OF NEW HAMPSHIRE.

Elevations of towns credited to this source are, in the main, from levels; those of mountain summits are from barometric work.

## GEOLOGICAL SURVEY OF NEW YORK.

Elevations were determined barometrically.

## GEOLOGICAL SURVEY OF VERMONT.

All elevations under this authority are from barometric determinations.

## GODDARD.

Determinations by level from preliminary railroad surveys made by the Central Pacific R. R. Co., of California. Like all preliminary work, these figures are not in the highest degree reliable.

## GUYOT, PROF. ARNOLD.

Nearly all the elevations given under this authority are in the Appalachian region, and nearly all were determined by barometer. They are of the highest character of this class of work. Most of the figures are copied from Professor Guyot's articles in the "American Journal of Science and Arts."

## HAYDEN, DR. F. V.

Under this authority is given all work done by the United States Geological Survey of the Territories. All determinations are barometric, or trigonometric resting on barometric bases. In most of this work effective measures were taken to avoid the well-known periodic errors incident to barometric work. The base-stations were placed, as nearly as possible, at the average height of the country to be surveyed. The high peaks were connected by a system of trigonometric leveling, by means of which, barometric observations, taken on different summits, were reduced to a common point. The mean results thus obtained were referred to base-stations located upon high mountain peaks.

## HIND, PROF. H. Y.

Assinaboine and Saskatchewan Exploring Expedition, 1858.  
Heights were measured by barometer.

## IVES.

Report of Colorado Exploring Expedition [Thirty-sixth Congress, first session, Senate Document].

All determinations are barometric.

## JENNEY, PROF. WILLIAM P.

Heights were abstracted from the map of the Black Hills.  
All determinations are barometric.

## JONES, CAPT. W. A.

Report of Expedition to Northwestern Wyoming and the Yellowstone Park, 1873.

All determinations are barometric.

## KING, CLARENCE.

This reference is mainly to the work of the Geological Exploration of the 40th Parallel.

All determinations are barometric, or depend upon barometric bases.

## LANDER.

Heights are taken from "Report on a Railroad Route from Puget Sound to South Pass," 1854. [House Document 129.]

Elevations were determined barometrically.

## LAND-OFFICE REPORTS. (L. O. REPORTS.)

Most of the heights given in these reports are the merest approximations.

## LA PEROUSE.

"Voyage to the Northwestern Coast of America," 1786.

Heights were determined by trigonometric measurements from sea bases.

## LUDLOW, CAPT. WILLIAM.

Under this authority are given elevations determined by his "Expedition to the Black Hills of Dakota," 1874, and his "Expedition to the Head of the Yellowstone and the Judith Basin," 1875.

Heights were measured by the barometer.

## MALESPINA.

"Voyage to the Northwestern Coast of America."

Heights were measured trigonometrically from bases at sea.

## MEDICAL DEPARTMENT, UNITED STATES ARMY (MED. DEPT. U. S. A.).

Nearly all heights given under this authority were determined barometrically.

## MEXICAN BOUNDARY SURVEY.

Elevations were determined barometrically.

## MULLAN, CAPT. JOHN.

"Explorations for a Wagon Road from Walla Walla to Fort Benton," 1862.

All heights were determined barometrically.

## NEW YORK STATE SURVEY.

These results are from refined trigonometric work.

NICOLAY.

"Explorations in the Upper Mississippi Region," 1836 to 1840.

All determinations were barometric.

## PACIFIC RAILROAD REPORTS (P. R. R. REPORTS).

Under this authority is included all work done by the War Department, between 1850 and 1855, for the purpose of finding a practicable railroad route from the Missouri River to the Pacific.

All the work is barometric, and, taken as a whole, is poor, owing mainly to the fact that, practically, there was no barometric base station. The hypsometric work of the expedition near the northern boundary, under Governor Stevens, was particularly bad. These remarks concerning the quality of the work apply equally well to all the earlier expeditions to the West, owing, doubtless, to the same cause.

PARRY, PROF. C. C.

Elevations were barometrically determined.

PETERMANN, DR. A.

Elevations were taken from his map of the United States.

POWELL, MAJ. J. W.

To this authority is credited the hypsometric work of the United States Geological and Geographical Survey of the Rocky Mountain Region.

## PRELIMINARY RAILROAD LEVELS (PRE. R. R. LEVELS).

These are distinguished from other railroad levels, because, as a rule, the preliminary levels are of a far less degree of accuracy; the results can therefore be accepted only with caution.

## RAILROADS.

Elevations determined by railroad levels are credited to the roads by which they were furnished. On page — *et seq.* will be found a list of these railroads, with the abbreviations used for them, arranged alphabetically in the order of the abbreviations. The height given is that of the track at the station. In cases where two or more railroads meet or cross at the same point on the same grade, the elevation by only one of them, and that the best known or best determined road, is given. The collection and adjustment of these levels has formed by far the greater part of the work of this compilation.

The profiles of most of the roads west of the Mississippi were col-

lected and published in "Lists of Elevations," 4th edition, in 1877. Since that time, circumstances have conspired to assist me greatly in the collection of this material in all parts of the country. In 1880, while I was connected with the Census Office, the late Chief Signal Officer, General A. J. Myer, courteously placed at the disposal of that office copies of all the material of this kind which had been collected by the Signal Office. Further, in the railroad schedule of census was inserted a request for an abstract of the profile of each road. This request was acceded to in all cases when possible, and through this means a great number of profiles from the most recent levels were received. Through the courtesy of the Census Office I have been permitted to use them in the present publication. Moreover, I have received within the past year profiles of a number of the most important roads in the country, which close up gaps in connections, and establish strong connecting links in chains of levels. In addition to the above, there were in print, principally in the reports of State geological surveys, a large number of profiles. Those of New Hampshire have been adjusted admirably and published in the report of the State Geological Survey. The same is the case with the large and complex system of Pennsylvania. The collection of profiles of this is exceptionally complete and admirably adjusted, and renders the portion of the Dictionary relating to this State by far the fullest and most satisfactory. The Geological Survey of New Jersey has published profiles of many of the roads of that State. The profiles of most of the roads of Virginia and West Virginia have been published by Maj. Jed. Hotchkiss, in his "Summary of Virginia" and the "Virginias." Profiles of most of the North Carolina roads have been published in the report of the State Geological Survey by Prof. W. C. Kerr; many of those of Alabama in the reports of Prof. E. A. Smith; of Ohio, in the State Geological Survey reports; of Indiana, in the reports of the Bureau of Statistics and Geology; of Wisconsin, Minnesota, and Iowa, in the reports of the geological surveys of those States. In this connection I desire to express my obligations to Prof. Warren Upham, of the geological and natural history survey of Minnesota, for his kind co-operation in the collection and adjustment of the railroad material in his State.

Much interest in this work has been manifested by railroad engineers, many of whom have contributed liberally of their time for the correction and proper connection of the profiles of their roads or systems of roads. Among them I should mention Mr. H. V. Hinckley, assistant engineer A., T. and S. F. R. R., who has, at great expenditure of time and labor, prepared a correct profile of his road, with its numerous branches; Mr. George H. Nettleton, president of the system of roads in southeastern Kansas; S. S. Montague, chief engineer of the Central Pacific system; and Mr. George Nealley, formerly assistant engineer on the Union Pacific Railroad, to whom I am indebted, in addition to other favors, for a correct profile of the Union Pacific Railroad.

While a great degree of success has attended my efforts for obtaining railroad profiles, there are still remaining a large number of roads, some of them of great importance, which have thus far failed to respond, owing in most cases to the fact that their records of levels have been destroyed.

The adjustment of these levels has been a most perplexing task. The errors in the compilation of the profiles themselves, and the uncertainties in the connections and crossings of different roads, together with the legitimate errors of leveling, conspire to make this work of adjustment one of the most difficult and unsatisfactory undertakings imaginable. I cannot claim that the result is by any means what could be desired, but I believe that, with the material and resources at hand, fairly good results have been obtained. The work of the United States Lake Survey in determining the heights of the Great Lakes, and of the Mississippi River Commission in determining the elevation of points along the Mississippi River, and of the transcontinental levels of the Coast and Geodetic Survey, have been accepted as starting-points.

The adjustment of the railroad levels of New Hampshire and of Pennsylvania has also been accepted, after subjecting it to tests for accuracy. The adjustment of railroad levels by Mr. James T. Gardiner, the results of which were published in the annual report of the United States Geological Survey of the Territories for 1873, was examined critically in the light of the determinations of heights made by the Coast and Lake Surveys, of the Mississippi River Commission, and the more recent and presumably more correct profiles received since the time of Mr. Gardiner's work. The changes in the heights of the Great Lakes, amounting to 7 feet (lower) in the cases of Michigan, Huron, and Superior, necessitated considerable changes in the States of Michigan, Wisconsin, and Minnesota, and the Territory of Dakota. The levels of the Mississippi River Commission lowered Cairo 12 feet, and the Saint Louis Directrix 15 feet. These corrections were even more wide-spread in their results. They induced changes throughout the whole of that portion of the country west of the Mississippi River as far as the Rocky Mountains. Eastward their effect was felt as far as Indianapolis, Ind., and the Falls of the Ohio. Aside from these changes in Mr. Gardiner's adjustment, his work has borne the tests admirably, and the results, with perhaps slight modification in certain cases, have been accepted and used for further adjustment.

It has been suggested that the method of least squares might be used to advantage in the adjustment of this material. This method does not seem to me to be at all applicable to the class of errors here encountered. These are, in the main, what may be classed as abnormal errors, due, not to want of accuracy of observations, but to mistakes, blunders, and uncertainties, a class of errors from which the method of least squares would deduce only false results.

## RAYNOLDS, CAPT. W. F.

Under this authority are given the hypsometric results of the expedition of Captain Reynolds to the country about the sources of the Snake and Missouri Rivers in 1860-'61.

All the work is barometric.

## RUFFNER.

"Reconnaissance in the Ute Country," 1873.

All determinations are barometric.

## SIMPSON, CAPT. J. H.

"Reconnaissance in Navajo Country," 1849 [Thirty-first Congress, first session, Senate Doc. 6.]; and "Explorations in the Great Basin of Utah," 1859, published in 1876.

All determinations are barometric.

## SMITHSONIAN INSTITUTION.

Most, if not all, of these elevations have been determined by barometer.

## STUART, GRANVILLE.

All determinations are barometric.

## TONER, DR. J. M.

Under this authority are given all heights taken from his "Dictionary of Elevations."

## UNITED STATES COAST AND GEODETIC SURVEY (U. S. C. AND G. S.).

Heights have been determined by the most refined geodetic methods.

## UNITED STATES ENGINEER CORPS (U. S. ENGR. CORPS).

The figures given under this authority are the results of exact levels.

UNITED STATES GEOLOGICAL AND GEOGRAPHICAL SURVEY OF THE  
ROCKY MOUNTAIN REGION.

All, or practically all, heights were determined by barometer.

## UNITED STATES LAKE SURVEY.

These results are from exact levels or refined trigonometric work.

## UNITED STATES SIGNAL OFFICE.

The character of these determinations was misstated in "Lists of Elevations, 4th Edition," published in 1877. In nearly all cases these elevations were determined from railway levels and from levels from railway bench-marks. They were determined by barometer only in cases where exact methods could not be employed.



## WALLEN.

"Explorations for a Wagon Road from the Dalles of the Columbia to Great Salt Lake, via Harney's Lake."

All determinations are barometric.

## WATER-POWER OF MAINE.

Most of the heights were obtained by level.

## WHEELER, CAPT. GEORGE M.

To this authority are credited all elevations determined by the United States Geographical Surveys West of the 100th Meridian.

Nearly all the work is barometric or trigonometric, depending upon barometric bases.

## WHITNEY, PROF. J. D.

Under this authority are given elevations determined by the Geological Survey of the State of California, and the "Geological and Topographical Reconnaissance of the South Park, Colorado."

All heights are barometrically determined.

## WILKES, CAPT. CHARLES.

"Voyage of Exploration to the Pacific."

## WILLIAMSON.

Elevations are all barometrically determined.

# **ABBREVIATIONS OF NAMES OF RAILROADS, GIVEN AS AUTHORITIES.**

|                             |                                                 |
|-----------------------------|-------------------------------------------------|
| Adir. R. R.....             | Adirondack Railroad.                            |
| A. C. R. R.....             | Alabama Central Railroad.                       |
| A. & D. R. R.....           | Adrian and Detroit Railroad.                    |
| A. & F. B. V. R. R.....     | Atlantic and French Broad Valley Railroad.      |
| Ala. G. S. R. R.....        | Alabama Great Southern Railroad.                |
| A. & G. W. R. R.....        | Atlantic and Great Western Railroad.            |
| A., G. & W. I. T. R. R..... | Atlantic, Gulf and West India Transit Railroad. |
| A. & L. R. R.....           | Albany and Lebanon Railroad.                    |
| A., M. & O. R. R.....       | Atlantic, Mississippi and Ohio Railroad.        |
| A. & N. R. R.....           | Atchison and Nebraska Railroad.                 |
| A. & N. C. R. R.....        | Atlantic and North Carolina Railroad.           |
| A. & P. R. R.....           | Atlantic and Pacific Railroad.                  |
| Ash. & P. R. R.....         | Ashtabula and Pittsburgh Railroad.              |
| A. & R. A. L. R. R.....     | Atlanta and Richmond Air Line Railroad.         |
| A. & S. R. R.....           | Albany and Susquehanna Railroad.                |
| A. & St. L. R. R.....       | Atlantic and St. Lawrence Railroad.             |
| A., T. & S. F. R. R.....    | Atchison, Topeka and Santa Fé Railroad.         |
| A. V. R. R.....             | Allegheny Valley Railroad.                      |
| A. & W. P. R. R.....        | Atlantic and West Point Railroad.               |
| B. R. R.....                | Barclay Railroad.                               |
| B. & A. R. R.....           | Brunswick and Albany Railroad.                  |
| Boston & Albany R. R.       | Boston and Albany Railroad.                     |
| Bed. & Bridge. R. R....     | Bedford and Bridgeport Railroad.                |
| Bost., Con. & Mont. R. R.   | Boston, Concord and Montreal Railroad.          |
| B., C. & P. R. R.....       | Buffalo, Corry and Pittsburgh Railroad.         |
| B., C. R. & N. R. R.....    | Burlington, Cedar Rapids and Northern Railroad. |
| B. & E. R. R.....           | Belleville and Eldorado Railroad.               |
| B. E. Valley R. R.....      | Bald Eagle Valley Railroad.                     |
| B. G. R. R.....             | Bell's Gap Railroad.                            |
| B. & H. R. R.....           | Baltimore and Hanover Railroad.                 |
| B. & M. R. R. R.....        | Burlington and Missouri River Railroad.         |
| B. & N. R. R.....           | Burlington and Northwestern Railroad.           |
| Bost. & N. Y. R. R....      | Boston and New York Railroad.                   |
| B., N. Y. & P. R. R....     | Boston, New York and Philadelphia Railroad.     |
| B. & O. R. R.....           | Baltimore and Ohio Railroad.                    |
| B. & P. R. R.....           | Baltimore and Potomac Railroad.                 |
| Bost. & Prov. R. R....      | Boston and Providence Railroad.                 |
| B., P. & C. R. R.....       | Baltimore, Pittsburgh and Chicago Railroad.     |
| B. & S. R. R.....           | Burlington and Southwestern Railroad.           |
| B. & S. Ill. R. R.....      | Belleville and Southern Illinois Railroad.      |
| B. & S. S. R. R....         | Bellefont and Snow Shoe Railroad.               |
| B. & S. W. R. R.....        | Bellaire and South Western Railroad.            |
| Buff. & S. W. R. R....      | Buffalo and South Western Railroad.             |
| R. V. R. R.....             | Buffalo Valley Railroad.                        |
| Cent. R. R.....             | Central Railroad (Ga.).                         |
| Chat. R. R.....             | Chateaugay Railroad.                            |

Camden & A. R. R. .... Camden and Amboy Railroad.  
 C. & A. R. R. .... Chicago and Alton Railroad.  
 C. B. & Q. R. R. .... Chicago, Burlington and Quincy Railroad.  
 C. C. R. R. .... Colorado Central Railroad.  
 Car. C. R. R. .... Carolina Central Railroad.  
 Charlotte, C. & A. R. R. Charlotte, Columbia and Augusta Railroad.  
 Corning, C. & A. R. R. Corning, Cowanesque and Antrim Railroad.  
 C., C., C. & I. R. R. .... Cleveland, Columbus, Cincinnati and Indianapolis Railroad.  
 C. C. & De R. R. R. .... Cazenovia, Canastota and De Ruyter Railroad.  
 C. D. & C. G. T. J. R. R. Chicago, Detroit and Canada Grand Trunk Junction Railroad.  
 C. & E. Ill. R. R. .... Chicago and Eastern Illinois Railroad.  
 C. & F. R. R. .... Catsaugua and Fogelsville Railroad.  
 C. F. & M. R. R. .... Cedar Falls and Minnesota Railroad.  
 C. & G. R. R. .... Columbia and Greenville Railroad.  
 C. G. & S. L. R. R. .... Cape Girardeau and State Line Railroad.  
 C. & G. T. R. R. .... Chicago and Grand Trunk Railroad.  
 C. H. & D. R. R. .... Cincinnati, Hamilton and Dayton Railroad.  
 C. & H. V. R. R. .... Columbus and Hocking Valley Railroad.  
 Cent. Iowa R. R. .... Central Iowa Railroad.  
 C. & I. R. R. .... Chicago and Iowa Railroad.  
 C., I., St. L. & C. R. R. Cincinnati, Indianapolis, Saint Louis and Chicago Railroad.  
 C. & L. N. G. R. R. .... Chester and Lenoir Narrow Gauge Railroad.  
 C. & M. L. S. R. R. .... Chicago and Michigan Lake Shore Railroad.  
 C. M. & St. P. R. R. .... Chicago, Milwaukee and Saint Paul Railroad.  
 C., Mt. V. & D. R. R. .... Cleveland, Mount Vernon and Delaware Railroad.  
 C. N. R. R. .... Cincinnati Northern Railroad.  
 C. & N. W. R. R. .... Chicago and North Western Railroad.  
 C. N. O. & T. P. R. R. .... Cincinnati, New Orleans and Texas Pacific Railroad.  
 C. & O. R. R. .... Chesapeake and Ohio Railroad.  
 Cal. P. R. R. .... California Pacific Railroad.  
 C. P. R. R. .... Central Pacific Railroad.  
 Cin. & P. R. R. .... Cincinnati and Portsmouth Railroad.  
 Conn. & Pass. R. R. .... Connecticut and Passumpsic Railroad.  
 Cleve. & P. R. R. .... Cleveland and Pittsburgh Railroad.  
 C. & P. D. R. R. .... Columbia and Port Deposit Railroad.  
 C. & R. R. R. .... Columbus and Rome Railroad.  
 Conn. River R. R. .... Connecticut River Railroad.  
 C. R. & Ft. W. R. R. .... Cincinnati, Richmond and Fort Wayne Railroad.  
 C., R. I. & P. R. R. .... Chicago, Rock Island and Pacific Railroad.  
 C. S. R. R. .... Cincinnati Southern Railroad.  
 C. & S. R. R. .... Cayuga and Susquehanna Railroad.  
 C. & St. L. R. R. .... Cairo and Saint Louis Railroad.  
 C., St. P., M. & O. R. R. Chicago, Saint Paul, Minneapolis and Omaha Railroad.  
 C., T. V. & W. R. R. .... Cleveland, Tuscarawas Valley and Wheeling Railroad.  
 C. & V. R. R. .... Cairo and Vincennes Railroad.  
 Cent. Vt. R. R. .... Central Vermont Railroad.  
 Conn. Western R. R. .... Connecticut Western Railroad.  
 C. & W. R. R. .... Catawissa and Williamsport Railroad.  
 C., W. & M. R. R. .... Cincinnati, Wabash and Michigan Railroad.  
 C. & Z. R. R. .... Cincinnati and Zanesville Railroad.  
 D. R. R. .... Delaware Railroad.  
 D., A. V. & P. R. R. .... Dunkirk, Allegheny Valley and Pittsburgh Railroad.  
 D. & B. C. R. R. .... Detroit and Bay City Railroad.  
 D. & B. V. R. R. .... Denver and Boulder Valley Railroad.  
 D. & D. R. R. .... Dorchester and Delaware Railroad.

|                          |                                                      |
|--------------------------|------------------------------------------------------|
| D., G., H. & M. R. R.    | Detroit, Grand Haven and Milwaukee Railroad.         |
| D., H. & W. R. R.        | Danville, Hazeltou and Western Railroad.             |
| D., L. & N. R. R.        | Detroit, Lansing and Northern Railroad.              |
| Del., L. & W. R. R.      | Delaware, Lackawanna and Western Railroad.           |
| D. M. & Ft. D. R. R.     | Des Moines and Fort Dodge Railroad.                  |
| D., M. & M. R. R.        | Detroit, Mackinac and Marquette Railroad.            |
| D. M. & N. W. R. R.      | Des Moines and North Western Railroad.               |
| D. P. R. R.              | Denver Pacific Railroad.                             |
| D. & R. Canal.           | Delaware and Raritan Canal.                          |
| D. & R. G. R. R.         | Denver and Rio Grande Railroad.                      |
| D. R. V. R. R.           | Duck River Valley Railroad.                          |
| D. & S. E. R. R.         | Dayton and South Eastern Railroad.                   |
| D. & S. P. R. R.         | Denver and South Park Railroad.                      |
| D. & St. P. R. R.        | Davenport and Saint Paul Railroad.                   |
| D. & S. W. R. R.         | Danville and South Western Railroad.                 |
| E. A. L. R. R.           | Elberton Air Line Railroad.                          |
| E. Broadtop R. R.        | East Broadtop Railroad.                              |
| E. B. & W. R. R.         | East Brandywine and Waynesburg Railroad.             |
| E. & C. R. R.            | Ebensburg and Cresson Railroad.                      |
| E., H. & N. R. R.        | Evansville, Henderson and Nashville Railroad.        |
| E. L. & B. S. R. R.      | Elizabethtown, Lexington and Big Sandy Railroad.     |
| E. L. & R. R. R.         | East Line and Red River Railroad.                    |
| E. M. R. R.              | East Mahanoy Railroad.                               |
| European & N. A. R. R.   | European and North American Railroad.                |
| E. Pa. R. R.             | East Pennsylvania Railroad.                          |
| E. & P. R. R.            | Erie and Pittsburgh Railroad.                        |
| Eureka & P. R. R.        | Eureka and Palisade Railroad.                        |
| Eel R. R. R.             | Eel River Railroad.                                  |
| E. S. R. R.              | Eastern Shore Railroad.                              |
| E. & T. H. R. R.         | Evansville and Terre Haute Railroad.                 |
| E., T. H. & C. R. R.     | Evansville, Terre Haute and Chicago Railroad.        |
| E. T., V. & G. R. R.     | East Tennessee, Virginia and Georgia Railroad.       |
| Ft. D. & Ft. R. R. R.    | Fort Dodge and Fort Ridgeley Railroad.               |
| F., J. & G. R. R.        | Fonda, Johnstown and Gloversville Railroad.          |
| F. & N. Y. R. R.         | Freehold and New York Railroad.                      |
| F., O. & C. R. R.        | Fredericksburg, Orange and Charlottesville Railroad. |
| Ft. M. & N. W. R. R.     | Fort Madison and North Western Railroad.             |
| Ft. S., S. E. & M. R. R. | Fort Scott, South Eastern and Memphis Railroad.      |
| Ft. W., J. & S. R. R.    | Fort Wayne, Jackson and Saginaw Railroad.            |
| Ge. R. R.                | Georgia Railroad.                                    |
| G. B. R. R.              | Green Bay Railroad.                                  |
| G., B. & C. R. R.        | Golden, Boulder and Caribou Railroad.                |
| G. B. & Minn. R. R.      | Green Bay and Minnesota Railroad.                    |
| G., C. & S. F. R. R.     | Gulf, Colorado and Santa Fé Railroad.                |
| G., H. & S. A. R. R.     | Galveston, Harrisburg and San Antonio Railroad.      |
| G., I. & S. R. R.        | Geneva, Ithaca and Sayre Railroad.                   |
| G., L. & S. J. R. R.     | Georgetown, Leadville and San Juan Railroad.         |
| G. R. & Ind. R. R.       | Grand Rapids and Indiana Railroad.                   |
| G. R. V. R. R.           | Grand River Valley Railroad.                         |
| G. & S. P. R. R.         | Golden and South Platte Railroad.                    |
| G., W. T. & P. R. R.     | Gulf, Western Texas and Pacific Railroad.            |
| H. & B. T. R. R.         | Huntington and Broad Top Railroad.                   |
| H. & C. M. R. R.         | Hannibal and Central Missouri Railroad.              |
| H. & N. R. R.            | Hannibal and Naples Railroad.                        |
| H., P. & F. R. R.        | Hartford, Providence and Fishkill Railroad.          |

|                            |                                                          |
|----------------------------|----------------------------------------------------------|
| H. & St. J. R. R           | Hannibal and Saint Joseph Railroad.                      |
| H. & T. C. R. R            | Houston and Texas Central Railroad.                      |
| I., B. & W. R. R           | Indiana, Bloomington and Western Railroad.               |
| Ill. Cent. R. R            | Illinois Central Railroad.                               |
| I., D. & S. R. R           | Indianapolis, Decatur and Springfield Railroad.          |
| I. & G. N. R. R            | International and Great Northern Railroad.               |
| Inds. & La F. R. R         | Indianapolis and La Fayette Railroad.                    |
| Ill. & St. L. R. R         | Illinois and Saint Louis Railroad.                       |
| Inds. & V. R. R            | Indianapolis and Vincennes Railroad.                     |
| J. & B. R. R               | Junction and Breakwater Railroad.                        |
| J. C. & Ft. K. R. R        | Junction City and Fort Kearney Railroad.                 |
| J., L. & S. R. R           | Jackson, Lansing and Saginaw Railroad.                   |
| J., M. & I. R. R           | Jeffersonville, Madison and Indianapolis Railroad.       |
| J. & N. Ind. R. R          | Joliet and Northern Indiana Railroad.                    |
| J. R. & K. Canal           | James River and Kanawha Canal.                           |
| J. S. E. R. R              | Jacksonville South Eastern Railroad.                     |
| J. S., P. C. & B. R. R     | Jersey Shore, Pine Creek and Buffalo Railroad.           |
| K. C. R. R                 | Kansas Central Railroad.                                 |
| K. C., Ft. S. & G. R. R    | Kansas City, Fort Scott and Gulf Railroad.               |
| K. C., L. & S. R. R        | Kansas City, Lawrence and Southern Railroad.             |
| K. C., St. J. & C. B. R. R | Kansas City, Saint Joseph and Council Bluffs Railroad.   |
| K. & N. W. R. R            | Keokuk and North Western Railroad.                       |
| K. P. R. R                 | Kansas Pacific Railroad.                                 |
| K. & S. H. R. R            | Kalamazoo and South Haven Railroad.                      |
| K. U. R. R                 | Kentucky Union Railroad.                                 |
| L. R. R                    | Lackawanna Railroad.                                     |
| L. & A. R. R               | Lowell and Andover Railroad.                             |
| L. A. & I. R. R            | Los Angeles and Independent Railroad.                    |
| L. B. R. R                 | Lawrenceville Branch Railroad.                           |
| L., C. & L. R. R           | Louisville, Cincinnati and Lexington Railroad.           |
| L. C. & S. C. R. R         | Lewisburg Center and Spruce Creek Railroad.              |
| L. E. & W. R. R            | Lake Erie and Western Railroad.                          |
| L. & L. R. R               | Lehigh and Lackawanna Railroad.                          |
| L. & M. R. R               | Louisville and Missouri River Railroad.                  |
| L., N. A. & C. R. R        | Louisville, New Albany and Chicago Railroad.             |
| L., N., S. & N. A. R. R    | Louisville, Nashville, South and North Alabama Railroad. |
| L. & Q. R. R               | Lancaster and Quarryville Railroad.                      |
| L. R. & Ft. S. R. R        | Little Rock and Fort Smith Railroad.                     |
| L. R. V. & Ark. R. R       | Little River Valley and Arkansas Railroad.               |
| L. & S. R. R               | Lehigh and Susquehanna Railroad.                         |
| L. Schuyl. R. R            | Little Schuylkill Railroad.                              |
| L. S. & M. R. R. R         | Lake Superior and Mississippi River Railroad.            |
| L. S. & M. S. R. R         | Lake Shore and Michigan Southern Railroad.               |
| L. & S. V. R. R            | Longview and Sabine Valley Railroad.                     |
| L. & S. W. R. R            | Lawrence and South Western Railroad.                     |
| L. & T. R. R               | Lebanon and Tremont Railroad.                            |
| M. R. R                    | Montrose Railroad.                                       |
| Mt. A. R. R                | Mont Alto Railroad.                                      |
| M. & A. G. T. R. R         | Mobile and Alabama Grand Trunk Railroad.                 |
| M. & B. R. R               | Macon and Brunswick Railroad.                            |
| Me. Cent. R. R             | Maine Central Railroad.                                  |
| Mass. Cent. R. R           | Massachusetts Central Railroad.                          |
| Mich. A. L. R. R           | Michigan Air Line Railroad.                              |
| Mich. Cent. R. R           | Michigan Central Railroad.                               |
| Mill C. R. R               | Mill Creek Railroad.                                     |

|                         |                                                |
|-------------------------|------------------------------------------------|
| Muncy C. R. R.          | Muncy Creek Railroad.                          |
| Memphis & C. R. R.      | Memphis and Charleston Railroad.               |
| M. & C. R. R.           | Marietta and Cincinnati Railroad.              |
| M. & C. Co. R. R.       | Mifflin and Center County Railroad.            |
| M. C. & S. B. R. R.     | Mauch Chunk and Switch Back Railroad.          |
| M. C. & T. R. R.        | Mississippi Central and Tennessee Railroad.    |
| M. & D. R. R.           | Mechanicsburg and Dillsburg Railroad.          |
| M. & E. R. R.           | Montgomery and Ennsaula Railroad.              |
| M. & G. R. R.           | Millville and Glassboro' Railroad.             |
| M., H. & O. R. R.       | Marquette, Houghton and Ontonagon Railroad.    |
| M. H. & S. H. R. R.     | Mine Hill and Schuylkill Haven Railroad.       |
| M. & I. Canal.          | Michigan and Illinois Canal.                   |
| Mo., Iowa & Neb. R. R.  | Missouri, Iowa and Nebraska Railroad.          |
| McK. & B. R. R.         | McKean and Buffalo Railroad.                   |
| M., K. & C. R. R.       | Memphis, Kansas and Colorado Railroad.         |
| Mo., Kans. & Tex. R. R. | Missouri, Kansas and Texas Railroad.           |
| M., K. & T. E. R. R.    | Missouri, Kansas and Texas Extension Railroad. |
| Man. & Lawrence R. R.   | Manchester and Lawrence Railroad.              |
| M. & L. R. R. R.        | Memphis and Little Rock Railroad.              |
| M., L. S. & W. R. R.    | Milwaukee, Lake Shore and Western Railroad.    |
| Morgan's L. & T. R. R.  | Morgan's Louisiana and Texas Railroad.         |
| Minn. Mid. R. R.        | Minnesota Midland Railroad.                    |
| M. & M. R. R.           | Mobile and Montgomery Railroad.                |
| Mil. & N. R. R. R.      | Milwaukee and Northern Railroad.               |
| M. & N. G. R. R.        | Marietta and North Georgia Railroad.           |
| Man. & N. Weare R. R.   | Manchester and North Weare Railroad.           |
| M. & N. W. R. R.        | Mobile and North Western Railroad.             |
| M. & O. R. R.           | Mobile and Ohio Railroad.                      |
| M. & P. R. R.           | Marietta and Pittsburgh Railroad.              |
| M. R. R. R.             | Mineral Range Railroad.                        |
| M. & S. R. R.           | Mahanoy and Shamokin Railroad.                 |
| M. & St. L. R. R.       | Minneapolis and Saint Louis Railroad.          |
| M. & W. R. R.           | Macon and Western Railroad.                    |
| M. & W. R. R. R.        | Montpelier and Wells River Railroad.           |
| N. Carolina R. R.       | North Carolina Railroad.                       |
| N. C. R. R.             | Northern Central Railroad.                     |
| N. C. & B. V. R. R.     | New Castle and Beaver Valley Railroad.         |
| N. C. & F. R. R.        | New Castle and Franklin Railroad.              |
| Nev. Co. N. G. R. R.    | Nevada County Narrow Gauge Railroad.           |
| N. D. & C. R. R.        | Newburgh, Dutchess and Connecticut Railroad.   |
| N. E. R. R.             | North Eastern Railroad.                        |
| N. E. Pa. R. R.         | North East Pennsylvania Railroad.              |
| N. H. & Northam. R. R.  | New Haven and Northampton Railroad.            |
| N. J. C. R. R.          | New Jersey Central Railroad.                   |
| N. M. & S. P. R. R.     | New Mexico and Southern Pacific Railroad.      |
| N. & N. R. R.           | Nashville and Northwestern Railroad.           |
| N. O. M. & T. R. R.     | New Orleans, Mobile and Texas Railroad.        |
| N. O. & N. E. R. R.     | New Orleans and North Eastern Railroad.        |
| N. P. R. R.             | Northern Pacific Railroad.                     |
| N. Pa. R. R.            | North Pennsylvania Railroad.                   |
| N. Valley R. R.         | Nesquehoning Valley Railroad.                  |
| N. & W. R. R.           | Norfolk and Western Railroad.                  |
| N. W. N. C. R. R.       | North Western North Carolina Railroad.         |
| N. W. U. R. R.          | North Western Union Railroad.                  |
| N. Y., B. & M. R. R.    | New York, Boston and Montreal Railroad.        |

N. Y. C. & H. R. R. R. . . . New York Central and Hudson River Railroad.  
 N. Y. C. & N. R. R. . . . . New York City and Northern Railroad.  
 N. Y. & H. R. R. . . . . . New York and Harlem Railroad.  
 N. Y., K. & S. R. R. . . . . New York, Kingston and Syracuse Railroad.  
 N. Y., L. E. & W. R. R. . . . New York, Lake Erie and Western Railroad.  
 N. Y. & N. H. R. R. . . . . New York and New Haven Railroad.  
 N. Y., N. H. & Htfd. R. R. . . New York, New Haven and Hartford Railroad.  
 N. Y. & O. M. R. R. . . . . New York and Oswego Midland Railroad.  
 N. Y., Prov. & Bost. R. R. . . New York, Providence and Boston Railroad.  
 N. Y., Pa. & O. R. R. . . . . New York, Pennsylvania and Ohio Railroad.  
 N. Y., R. & P. R. R. . . . . New York, Ridgeway and Petersburg Railroad  
 O. & E. Canal . . . . . Ohio and Erie Canal.  
 O. & M. R. R. . . . . . Ohio and Mississippi Railroad.  
 O., N. & B. H. R. R. . . . . Omaha, Niobrara and Black Hills Railroad  
 O. & R. V. R. R. . . . . . Omaha and Republican Valley Railroad.  
 Oreg. R. R. & Nav. Co. . . . . Oregon Railroad and Navigation Company.  
 O. & R. R. R. . . . . . Oswego and Rome Railroad.  
 Oregon & Cal. R. R. . . . . Oregon and California Railroad.  
 O. & S. R. R. . . . . . Oswego and Syracuse Railroad.  
 P. R. R. . . . . . Perkiomen Railroad.  
 Pa. R. R. . . . . . Pennsylvania Railroad.  
 Peters. R. R. . . . . . Petersburg Railroad.  
 P. A. L. R. R. . . . . . Piedmont Air Line Railroad.  
 P. B. R. R. . . . . . Peach Bottom Railroad.  
 P. & B. C. R. R. . . . . . Philadelphia and Baltimore Central Railroad.  
 P. & C. R. R. . . . . . Pittsburgh and Connellsville Railroad.  
 P., C. & St. L. R. R. . . . . Pittsburgh, Cincinnati and St. Louis Railroad.  
 P. & D. R. R. . . . . . Passaic and Delaware Railroad.  
 Pa. & Del. R. R. . . . . . Pennsylvania and Delaware Railroad.  
 P., D. & E. R. R. . . . . . Peoria, Decatur and Evansville Railroad.  
 P. & E. R. R. . . . . . Philadelphia and Erie Railroad.  
 Paducah & E. R. R. . . . . Paducah and Elizabethtown Railroad.  
 P., Ft. W. & C. R. R. . . . . Pittsburgh, Fort Wayne and Chicago Railroad.  
 P., G. F. & C. R. R. . . . . Portsmouth, Great Falls and Conway Railroad.  
 P., H. & B. R. R. . . . . . Poughkeepsie, Hartford and Boston Railroad.  
 P. H. & N. W. R. R. . . . . Port Huron and Northwestern Railroad.  
 P. & K. C. R. R. . . . . . Parker and Kansas City Railroad.  
 P., K. & P. R. R. . . . . . Plymouth, Kankakee and Pacific Railroad.  
 Port. & Ogden. R. R. . . . . Portland and Ogdensburg Railroad.  
 Phil. & N. R. R. . . . . . Philadelphia and Newtown Railroad.  
 P. & P. R. R. . . . . . Pennsylvania and Petroleum Railroad.  
 P., P. & J. R. R. . . . . . Peoria, Pekin and Jacksonville Railroad.  
 P. R. R. R. . . . . . Port Royal Railroad.  
 Phil. & R. R. R. . . . . . Philadelphia and Reading Railroad.  
 P. & R. I. R. R. . . . . . Peoria and Rock Island Railroad.  
 Prov. & Spring. R. R. . . . . Providence and Springfield Railroad.  
 Phil. & T. R. R. . . . . . Philadelphia and Trenton Railroad.  
 P., T. & B. R. R. . . . . . Pittsburgh, Titusville and Buffalo Railroad.  
 P., V. & C. R. R. . . . . . Pittsburgh, Virginia and Charleston Railroad.  
 Prov. & Worces. R. R. . . . . Providence and Worcester Railroad.  
 P., W. & B. R. R. . . . . . Philadelphia, Wilmington and Baltimore Railroad  
 Prov., Warren & Bris-  
 tol R. R. . . . . . Providence, Warren and Bristol Railroad.  
 R. & A. R. R. . . . . . Richmond and Alleghany Railroad.  
 R. & A. A. L. R. R. . . . . Raleigh and Augusta Air Line Railroad.

|                                     |                                                         |
|-------------------------------------|---------------------------------------------------------|
| R. & C. R. R.                       | Reading and Columbia Railroad.                          |
| Rome & C. R. R.                     | Rome and Clinton Railroad.                              |
| R. & D. R. R.                       | Richmond and Danville Railroad.                         |
| R., F. & P. R. R.                   | Richmond, Fredericksburgh and Potomac Railroad.         |
| R. G. R. R.                         | Rio Grande Railroad.                                    |
| R. & G. R. R.                       | Raleigh and Gaston Railroad.                            |
| R. H. R. R.                         | Rich Hill Railroad.                                     |
| R., N. & P. R. R.                   | Rochester, Nunda and Pennsylvania Railroad.             |
| R. & P. R. R.                       | Richmond and Petersburg Railroad.                       |
| R. & S. L. R. R.                    | Rochester and State Line Railroad.                      |
| R. & S. R. R.                       | Rensselaer and Saratoga Railroad.                       |
| R. V. & B. & C. R. R.               | Republican Valley and Burlington and Colorado Railroad. |
| R., W. & O. R. R.                   | Rome, Watertown and Ogdensburgh Railroad.               |
| R., Y. R. & C. R. R.                | Richmond, York River and Chesapeake Railroad.           |
| S. R. R.                            | Salisbury Railroad.                                     |
| S. & A. R. R.                       | Shenango and Allegheny Railroad.                        |
| Spring, Athol & North-<br>ern R. R. | Springfield, Athol and Northern Railroad.               |
| S. B. R. R.                         | Summit Branch Railroad.                                 |
| S. & B. R. R.                       | Syracuse and Binghamton Railroad.                       |
| S. C. R. R.                         | Southern Central Railroad.                              |
| S. Carolina R. R.                   | South Carolina Railroad.                                |
| S. & C. R. R.                       | Savannah and Charleston Railroad.                       |
| S. C. & D. R. R.                    | Sioux City and Dakota Railroad.                         |
| S. C. & J. R. R.                    | Short Creek and Joplin Railroad.                        |
| S. C. & P. R. R.                    | Sioux City and Pacific Railroad.                        |
| S. & C. V. R. R.                    | Syracuse and Chenango Valley Railroad.                  |
| S., G. & C. R. R.                   | Syracuse, Geneva and Corning Railroad.                  |
| St. J. & D. C. R. R.                | Saint Joseph and Denver City Railroad.                  |
| S. K. & W. R. R.                    | Southern Kansas and Western Railroad.                   |
| S. & L. R. R.                       | Sunbury and Lewiston Railroad.                          |
| St. L., I. Mt. & S. R. R.           | Saint Louis, Iron Mountain and Southern Railroad.       |
| St. L., K. C. & N. R. R.            | Saint Louis, Kansas City and Northern Railroad.         |
| S. L. & S. R. R.                    | State Line and Sullivan Railroad.                       |
| St. L. & S. E. R. R.                | Saint Louis and South Eastern Railroad.                 |
| St. L. & S. F. R. R.                | Saint Louis and San Francisco Railroad.                 |
| St. L., S. & L. R. R. R.            | Saint Louis, Salem and Little Rock Railroad.            |
| St. L., V. & T. H. R. R.            | Saint Louis, Vandalia and Terre Haute Railroad.         |
| S. & M. R. R.                       | Savannah and Memphis Railroad.                          |
| S. & M. P. R. R.                    | Somerset and Mineral Point Railroad.                    |
| S. & N. B. R. R.                    | Selinsgrove and North Branch Railroad.                  |
| S. P. R. R.                         | Southern Pacific Railroad.                              |
| S. & P. R. R.                       | Sacramento and Placerville Railroad.                    |
| St. P. & P. R. R.                   | Saint Paul and Pacific Railroad.                        |
| St. P. & S. C. R. R.                | Saint Paul and Sioux City Railroad.                     |
| S. P., S., & T. F. R. R.            | Saint Paul, Stillwater and Taylor's Falls Railroad.     |
| S., R. & D. R. R.                   | Selma, Rome and Dalton Railroad.                        |
| S. & R. R. R.                       | Seaboard and Roanoke Railroad.                          |
| S. & S. R. R.                       | Schuykill and Susquehanna Railroad.                     |
| S. & S. W. R. R.                    | Salina and South Western Railroad.                      |
| S. W. R. R.                         | South Western Railroad.                                 |
| S. W. Pa. R. R.                     | South West Pennsylvania Railroad.                       |
| T. C. R. R.                         | Texas Central Railroad.                                 |
| T. & C. R. R.                       | Tyrone and Clearfield Railroad.                         |
| T., E. & S. L. R. R.                | Tioga, Elmira and State Line Railroad.                  |



|                              |                                                                |
|------------------------------|----------------------------------------------------------------|
| T. H. & Inds. R. R . . . . . | Terre Haute and Indianapolis Railroad.                         |
| T. H. & S. R. R. . . . . .   | Terre Haute and Southeastern Railroad.                         |
| T. & N. O. R. R . . . . .    | Texas and New Orleans Railroad.                                |
| T. & P. R. R . . . . .       | Texas and Pacific Railroad.                                    |
| T. P. & W. R. R. . . . . .   | Toledo, Peoria and Warsaw Railroad.                            |
| T. W. & W. R. R . . . . .    | Toledo, Wabash and Western Railroad.                           |
| U. & B. R. R. R . . . . .    | Utica and Black River Railroad.                                |
| U. C. R. R . . . . .         | Utah Central Railroad.                                         |
| U., C. & B. R. R. . . . .    | Utica, Clinton and Binghamton Railroad.                        |
| U., C. & S. R. R. . . . .    | Utica, Chenango and Susquehanna Valley Railroad.               |
| U. & D. R. R. . . . . .      | Ulster and Delaware Railroad.                                  |
| U., I. & E. R. R. . . . .    | Utica, Ithaca and Elmira Railroad.                             |
| U. & N. R. R. . . . . .      | Utah and Northern Railroad.                                    |
| U. & N. F. R. R . . . . .    | Ursina and North Fork Railroad.                                |
| U. P. R. R . . . . .         | Union Pacific Railroad.                                        |
| U. S. R. R . . . . .         | Utah Southern Railroad.                                        |
| U. & T. R. R. . . . . .      | Union and Titusville Railroad.                                 |
| U. T. Co. R. R. . . . . .    | Union Transit Company Railroad.                                |
| U. W. R. R. . . . . .        | Utah Western Railroad.                                         |
| V. R. R . . . . .            | Valley Railroad.                                               |
| Vt. & Mass. R. R . . . . .   | Vermont and Massachusetts Railroad.                            |
| V., M., T. & G. R. R . . . . | Vermont, Massachusetts, Troy and Greenfield Railroad.          |
| V. & N. R. R . . . . .       | Vicksburg and Nashville Railroad.                              |
| Vt. Valley R. R . . . . .    | Vermont Valley Railroad.                                       |
| W. R. R. . . . . .           | Western Railroad (Ala.).                                       |
| W. & A. R. R . . . . .       | Western and Atlantic Railroad.                                 |
| W. C. R. R . . . . .         | West Chester Railroad.                                         |
| Wis. Cent. R. R . . . . .    | Wisconsin Central Railroad.                                    |
| W. C. & P. R. R . . . . .    | West Chester and Philadelphia Railroad.                        |
| W. C., Va. M. & G. S. R. R   | Washington City, Virginia Midland and Great Southern Railroad. |
| W. & E. R. R. . . . . .      | Williamsport and Elmira Railroad.                              |
| W. & E. Canal. . . . .       | Wabash and Erie Canal.                                         |
| W. J. R. R. . . . . .        | West Jersey Railroad.                                          |
| W. N. C. R. R . . . . .      | Western North Carolina Railroad.                               |
| W. Md. R. R . . . . .        | Western Maryland Railroad.                                     |
| W. & O. R. R. . . . . .      | Washington and Ohio Railroad.                                  |
| W. & O. & O. C. R. R. . . .  | Western and Oregon, and Oregon Central Railroad.               |
| W. Pa. R. R . . . . .        | West Pennsylvania Railroad.                                    |
| W. & R. R. R. . . . . .      | Wilmington and Reading Railroad.                               |
| W., St. L. & P. R. R. . . .  | Wabash, Saint Louis and Pacific Railroad.                      |
| W. V. R. R. . . . . .        | Walkill Valley Railroad.                                       |
| Wis. Val. R. R . . . . .     | Wisconsin Valley Railroad                                      |
| Warwick V. R. R. . . . .     | Warwick Valley Railroad.                                       |
| W. Va. C. & P. R. R. . . .   | West Virginia Central and Pittsburgh Railroad.                 |
| W. & W. R. R. . . . . .      | Wilmington and Western Railroad.                               |
| Yough. R. R . . . . .        | Youghiogeny Railroad.                                          |
| Y. Br. Pa. R. . . . . .      | York Branch Pennsylvania Railroad.                             |

# ALABAMA.

| Station.                                | Authority.                 | Elevation.   |
|-----------------------------------------|----------------------------|--------------|
|                                         |                            | <i>Feet.</i> |
| Acron.....                              | Ala. G. S. R. R.....       | 149          |
| Alexander City.....                     | S. & M. R. R.....          | 742          |
| Alpine.....                             | S. R. & D. R. R.....       | 470          |
| Ambeson.....                            | S. R. & D. R. R.....       | 702          |
| Ashly.....                              | S. R. & D. R. R.....       | 456          |
| Atalla.....                             | Ala. G. S. R. R.....       | 602          |
| Athens.....                             | L. N. S. & N. A. R. R..... | 707          |
| Bangor.....                             | L. N. S. & N. A. R. R..... | 466          |
| Barclay.....                            | S. R. & D. R. R.....       | 509          |
| Barton.....                             | Memphis & C. R. R.....     | 498          |
| Batesville.....                         | M. & E. R. R.....          | 280          |
| Battles.....                            | Ala. G. S. R. R.....       | 152          |
| Beaver Meadow.....                      | M. & O. R. R.....          | 136          |
| Bellefonte.....                         | Memphis & C. R. R.....     | 639          |
| Bellevue.....                           | A. C. R. R.....            | 160          |
| Bibb Mills.....                         | S. R. & D. R. R.....       | 446          |
| Birmingham.....                         | Ala. G. S. R. R.....       | 596          |
| Blount Springs.....                     | L. N. S. & N. A. R. R..... | 432          |
| Blue Mountain.....                      | S. R. & D. R. R.....       | 791          |
| Boligee.....                            | Ala. G. S. R. R.....       | 123          |
| Boyle.....                              | L. N. S. & N. A. R. R..... | 522          |
| Brandon.....                            | Ala. G. S. R. R.....       | 896          |
| Brierfield.....                         | S. R. & D. R. R.....       | 388          |
| Brocks.....                             | L. N. S. & N. A. R. R..... | 562          |
| Brownsboro'.....                        | Memphis & C. R. R.....     | 631          |
| Brown's Cut.....                        | Ala. G. S. R. R.....       | 244          |
| Burnsville.....                         | S. R. & D. R. R.....       | 182          |
| Cahabamines.....                        | L. N. S. & N. A. R. R..... | 598          |
| Calera.....                             | L. N. S. & N. A. R. R..... | 500          |
| Calvert.....                            | M. & A. G. T. R. R.....    | 57           |
| Camp Hill.....                          | S. & M. R. R.....          | 733          |
| Carson.....                             | M. & A. G. T. R. R.....    | 54           |
| Carthage.....                           | Ala. G. S. R. R.....       | 176          |
| Centerville, west bank Cahaba, opp..... | M. & A. G. R. R.....       | 252          |
| Chehaw.....                             | W. R. R., of Ala.....      | 252          |
| Chestang.....                           | M. & A. G. T. R. R.....    | 43           |
| Childersburgh.....                      | S. R. & D. R. R.....       | 416          |
| Chinchilla.....                         | M. & O. R. R.....          | 78           |
| Citronelle.....                         | M. & O. R. R.....          | 317          |
| Clanton.....                            | L. N. S. & N. A. R. R..... | 594          |
| Clays.....                              | S. R. & D. R. R.....       | 193          |
| Clear Creek.....                        | L. N. S. & N. A. R. R..... | 538          |
| Clements.....                           | Ala. G. S. R. R.....       | 419          |
| Cleveland.....                          | M. & A. G. T. R. R.....    | 15           |
| Coasada.....                            | L. N. S. & N. A. R. R..... | 183          |
| Cold Creek.....                         | M. & A. G. T. R. R.....    | 34           |
| Collinsville.....                       | Ala. G. S. R. R.....       | 738          |
| Columbiana.....                         | S. R. & D. R. R.....       | 535          |
| Columbus.....                           | W. R. R.....               | 262          |
| Coopers.....                            | L. N. S. & N. A. R. R..... | 456          |
| Coosa Station.....                      | S. R. & D. R. R.....       | 447          |
| Cottondale.....                         | Ala. G. S. R. R.....       | 273          |
| Courtland.....                          | Memphis & C. R. R.....     | 560          |
| Coxe's.....                             | S. R. & D. R. R.....       | 373          |
| Creola.....                             | M. & A. G. T. R. R.....    | 23           |
| Cross Plains.....                       | S. R. & D. R. R.....       | 697          |
| Cuba.....                               | Ala. G. S. R. R.....       | 219          |
| Cullman.....                            | L. N. S. & N. A. R. R..... | 800          |

| Station.                    | Authority.                  | Elevation. |
|-----------------------------|-----------------------------|------------|
|                             |                             | Feet.      |
| Cunningham .....            | L. N. S. & N. A. R. R. .... | 438        |
| Currys .....                | S. R. & D. R. R. ....       | 540        |
| Dadeville .....             | S. & M. R. R. ....          | 755        |
| Deatsville .....            | L. N. S. & N. A. R. R. .... | 298        |
| Decatur .....               | L. N. S. & N. A. R. R. .... | 575        |
| Deer Park .....             | M. & O. R. R. ....          | 148        |
| Dickson .....               | Memphis & C. R. R. ....     | 498        |
| Dixie .....                 | S. R. & D. R. R. ....       | 228        |
| Elkmont .....               | L. N. S. & N. A. R. R. .... | 796        |
| Elmore .....                | L. N. S. & N. A. R. R. .... | 197        |
| Epes .....                  | Ala. G. S. R. R. ....       | 129        |
| Eufaula .....               | M. & E. R. R. ....          | 200        |
| Eureka .....                | Ala. G. S. R. R. ....       | 979        |
| Eutaw .....                 | Ala. G. S. R. R. ....       | 129        |
| Falkville .....             | L. N. S. & N. A. R. R. .... | 601        |
| Fitzpatrick's .....         | M. & E. R. R. ....          | 222        |
| Flint .....                 | L. N. S. & N. A. R. R. .... | 566        |
| Foots .....                 | L. N. S. & N. A. R. R. .... | 646        |
| Fort Deposit .....          | M. & M. R. R. ....          | 520        |
| Fort Payne .....            | Ala. G. S. R. R. ....       | 883        |
| Gardners' .....             | S. R. & D. R. R. ....       | 542        |
| Gilmer .....                | L. N. S. & N. A. R. R. .... | 536        |
| Gold Hill .....             | S. & M. R. R. ....          | 765        |
| Goldsby .....               | A. C. R. R. ....            | 183        |
| Goodwater .....             | S. & M. R. R. ....          | 867        |
| Greenpond .....             | Ala. G. S. R. R. ....       | 491        |
| Greenwood .....             | Ala. G. S. R. R. ....       | 691        |
| Griffiths' Mills .....      | S. R. & D. R. R. ....       | 691        |
| Hampden .....               | M. & A. G. T. R. R. ....    | 180        |
| Harperville .....           | Ala. G. S. R. R. ....       | 186        |
| Harrall's Cross-roads ..... | A. C. R. R. ....            | 192        |
| Harris .....                | L. N. S. & N. A. R. R. .... | 562        |
| Hartsell's .....            | L. N. S. & N. A. R. R. .... | 671        |
| Hays Mills .....            | L. N. S. & N. A. R. R. .... | 751        |
| Helena .....                | L. N. S. & N. A. R. R. .... | 398        |
| Hollimans .....             | Ala. G. S. R. R. ....       | 937        |
| Hulls .....                 | Ala. G. S. R. R. ....       | 141        |
| Huntsville .....            | Memphis & C. R. R. ....     | 612        |
| Ironton .....               | L. N. S. & N. A. R. M. .... | 660        |
| Jackson .....               | M. C. & T. R. R. ....       | 459        |
| Jackson's Gap .....         | S. & M. R. R. ....          | 690        |
| Jacksonville .....          | S. R. & D. R. R. ....       | 628        |
| Jamison .....               | L. N. S. & N. A. R. R. .... | 704        |
| Jonesboro' .....            | Ala. G. S. R. R. ....       | 527        |
| Jones Station .....         | A. C. R. R. ....            | 219        |
| Kellyton .....              | S. & M. R. R. ....          | 800        |
| Kymulga .....               | S. R. & D. R. R. ....       | 496        |
| Ladiga .....                | S. R. & D. R. R. ....       | 671        |
| Larkinsville .....          | Memphis & C. R. R. ....     | 620        |
| Lary's .....                | L. N. S. & N. A. R. R. .... | 160        |
| Leighton .....              | Memphis & C. R. R. ....     | 563        |
| Leona .....                 | M. & A. G. T. R. R. ....    | 54         |
| Livingston .....            | Ala. G. S. R. R. ....       | 144        |
| Logan .....                 | A. C. R. R. ....            | 134        |
| Lomax .....                 | L. N. S. & N. A. R. R. .... | 623        |
| McCalla .....               | Ala. G. S. R. R. ....       | 495        |
| McDonald .....              | L. N. S. & N. A. R. R. .... | 683        |
| Madison .....               | Memphis & C. R. R. ....     | 573        |
| Maplesville .....           | S. R. & D. R. R. ....       | 366        |
| Marion .....                | M. & A. G. T. R. R. ....    | 953        |
| Matthews .....              | M. & E. R. R. ....          | 962        |
| Maxwell .....               | Ala. G. S. R. R. ....       | 176        |
| Midway .....                | M. & E. R. R. ....          | 506        |

| Station.                          | Authority.                  | Elevation.   |
|-----------------------------------|-----------------------------|--------------|
|                                   |                             | <i>Feet.</i> |
| Milner .....                      | L. N. S. & N. A. R. R. .... | 838          |
| Miner Station .....               | A. C. R. R. ....            | 119          |
| Mitchell .....                    | M. & E. R. R. ....          | 252          |
| Mobile .....                      | M. & O. R. R. ....          | 6            |
| " Signal Station .....            | U. S. Signal Office .....   | 69           |
| Montevallo .....                  | S. R. & D. R. R. ....       | 469          |
| Montgomery .....                  | L. N. S. & N. A. R. R. .... | 162          |
| " Signal Station .....            | U. S. Signal Office .....   | 219          |
| Morris .....                      | L. N. S. & N. A. R. R. .... | 406          |
| Mountain Creek .....              | L. N. S. & N. A. R. R. .... | 540          |
| Mount Vernon .....                | M. & A. G. T. R. R. ....    | 49           |
| Munford .....                     | S. R. & D. R. R. ....       | 621          |
| Nebo Mount, tunnel at grade ..... | M. & A. G. T. R. R. ....    | 330          |
| " summit of mount .....           | M. & A. G. T. R. R. ....    | 449          |
| Oak Grove .....                   | M. & E. R. R. ....          | 226          |
| Olmstead .....                    | Ala. G. S. R. R. ....       | 288          |
| Opelika .....                     | W. R. R., of Ala. ....      | 812          |
| Oxford .....                      | S. R. & D. R. R. ....       | 653          |
| Patona .....                      | S. R. & D. R. R. ....       | 689          |
| Peeples .....                     | S. R. & D. R. R. ....       | 213          |
| Pelham .....                      | L. N. S. & N. A. R. R. .... | 425          |
| Pensacola Junction .....          | M. & M. R. R. ....          | 68           |
| Phelan .....                      | L. N. S. & N. A. R. R. .... | 790          |
| Pike Road .....                   | M. & E. R. R. ....          | 295          |
| Plantersville .....               | S. R. & D. R. R. ....       | 241          |
| Plateau .....                     | M. & A. G. T. R. R. ....    | 37           |
| Pollard .....                     | M. & M. R. R. ....          | 67           |
| Randolph .....                    | S. R. & D. R. R. ....       | 548          |
| Reese .....                       | Ala. G. S. R. R. ....       | 599          |
| Reid .....                        | L. N. S. & N. A. R. R. .... | 591          |
| Scottsboro' .....                 | Memphis & C. R. R. ....     | 652          |
| Selma .....                       | W. R. R. ....               | 122          |
| " n. e. bank Alabama River .....  | A. C. R. R. ....            | 110          |
| " Junction, Western R. R. ....    | A. C. R. R. ....            | 108          |
| " crossing, S. R. & D. R. R. .... | A. C. R. R. ....            | 112          |
| " Depot, Broad street .....       | A. C. R. R. ....            | 122          |
| " crossing, N. O. & S. R. R. .... | A. C. R. R. ....            | 121          |
| Sepulga .....                     | M. & M. R. R. ....          | 200          |
| Shade's Creek .....               | L. N. S. & N. A. R. R. .... | 610          |
| Shelby Springs .....              | S. R. & D. R. R. ....       | 529          |
| Siluria .....                     | L. N. S. & N. A. R. R. .... | 462          |
| Silver Run .....                  | S. R. & D. R. R. ....       | 630          |
| Slade's .....                     | M. & A. G. T. R. R. ....    | 54           |
| Smallwood's .....                 | Ala. G. S. R. R. ....       | 429          |
| Spring Hill .....                 | M. & E. R. R. ....          | 312          |
| Springville .....                 | Ala. G. S. R. R. ....       | 727          |
| Standiford .....                  | Ala. G. S. R. R. ....       | 574          |
| Steel's .....                     | Ala. G. S. R. R. ....       | 610          |
| Stevenson .....                   | Memphis & C. R. R. ....     | 602          |
| Stewart's .....                   | Ala. G. S. R. R. ....       | 159          |
| Sturdevant .....                  | S. & M. R. R. ....          | 497          |
| Sunflower .....                   | M. & A. G. T. R. R. ....    | 28           |
| Sword's Mills .....               | S. R. & D. R. R. ....       | 741          |
| Talladega .....                   | S. R. & D. R. R. ....       | 561          |
| Tannehill .....                   | Ala. G. S. R. R. ....       | 485          |
| Taylor's .....                    | A. C. R. R. ....            | 173          |
| Tensas .....                      | M. & M. R. R. ....          | 8            |
| Thompson's .....                  | M. & E. R. R. ....          | 289          |
| Three-Notch Road .....            | M. & E. R. R. ....          | 492          |
| Town Creek .....                  | Memphis & C. R. R. ....     | 560          |
| Trinity .....                     | M. & C. R. R. ....          | 634          |
| Trussville .....                  | Ala. G. S. R. R. ....       | 702          |
| Tuscaloosa .....                  | Ala. G. S. R. R. ....       | 181          |

| Station.                                  | Authority.                 | Elevation.   |
|-------------------------------------------|----------------------------|--------------|
|                                           |                            | <i>Feet.</i> |
| Tuscumbia.....                            | Memphis & C. R. R.....     | 488          |
| Union Springs (M. & G. R. R. crossing)... | M. & E. R. R.....          | 494          |
| Uniontown (Ala. Cen. R. R. crossing)..... | M. & A. G. T. R. R.....    | 274          |
| Do ..... Depot.....                       | A. C. R. R.....            | 282          |
| Valley Head.....                          | Ala. G. S. R. R.....       | 1,031        |
| Vance's.....                              | Ala. G. S. R. R.....       | 514          |
| Verbena.....                              | L. N. S. & N. A. R. R..... | 448          |
| Veto.....                                 | S. R. & D. R. R.....       | 160          |
| Warrior.....                              | L. N. S. & N. A. R. R..... | 547          |
| Waverly.....                              | S. & M. R. R.....          | 805          |
| West Point.....                           | W. R. R. of Ala.....       | 417          |
| Wetumpka.....                             | L. N. S. & N. A. R. R..... | 183          |
| Whistler.....                             | M. & O. R. R.....          | 41           |
| Whiting.....                              | L. N. S. & N. A. R. R..... | 553          |
| Whitney.....                              | Ala. G. S. R. R.....       | 613          |
| Wilhite.....                              | L. N. S. & N. A. R. R..... | 606          |
| Williams' Cross-Roads.....                | Ala. G. S. R. R.....       | 514          |
| Wilsonville.....                          | S. R. & D. R. R.....       | 427          |
| Woodstock.....                            | Ala. G. S. R. R.....       | 519          |
| Woodville.....                            | Memphis & C. R. R.....     | 596          |
| York.....                                 | Ala. G. S. R. R.....       | 159          |

# ALASKA.

| Station.                    | Authority.                    | Elevation.   |
|-----------------------------|-------------------------------|--------------|
|                             |                               | <i>Feet.</i> |
| Adakh .....                 | U. S. C. & G. S. ....         | 5,678        |
| Akutan .....                | U. S. C. & G. S. ....         | 3,888        |
| Atka .....                  | U. S. C. & G. S. ....         | 4,988        |
| Avatanak .....              | U. S. C. & G. S. ....         | 1,207        |
| Bogosloff .....             | U. S. C. & G. S. ....         | 844          |
| Bouldys, Peak of .....      | U. S. C. & G. S. ....         | 1,145        |
| Chuqul .....                | U. S. C. & G. S. ....         | 3,109        |
| Cook, Mt. ....              | Dall .....                    | 16,000       |
| Crillon, Mt. ....           | Dall .....                    | 15,900       |
| Devastation, Mt. ....       | U. S. C. & G. S. ....         | 5,525        |
| Edgecombe, Mt. ....         | U. S. C. & G. S. ....         | 2,855        |
| Fairweather, Mt. ....       | Malespina .....               | 14,589       |
| Do .....                    | Tebenkoff .....               | 14,000       |
| Do .....                    | Vasilieff .....               | 13,946       |
| Do .....                    | Russian hydro. chart .....    | 14,708       |
| Do .....                    | English Admiralty chart ..... | 14,708       |
| Do .....                    | Tebenkoff, chart iii .....    | 13,864       |
| Do .....                    | Dall .....                    | 15,500       |
| Gareloi .....               | U. S. C. & G. S. ....         | 5,334        |
| Garyalaya .....             | U. S. C. & G. S. ....         | 11,270       |
| Illiaminsk .....            | U. S. C. & G. S. ....         | 12,066       |
| Kyaka, North Peak .....     | U. S. C. & G. S. ....         | 4,025        |
| Macushin .....              | U. S. C. & G. S. ....         | 5,961        |
| St. Elias, Mt. ....         | Malespina .....               | 17,854       |
| Do .....                    | Tebenkoff .....               | 16,938       |
| Do .....                    | La Perouse .....              | 12,661       |
| Do .....                    | English hydro. chart .....    | 14,970       |
| Do .....                    | Russian hydro. chart .....    | 17,854       |
| Do .....                    | Dall .....                    | 19,500       |
| Shishaldin .....            | U. S. C. & G. S. ....         | 8,683        |
| Sitka, Signal Station ..... | U. S. Signal Office .....     | 63           |
| Tanaga .....                | U. S. C. & G. S. ....         | 7,108        |
| Unalaska .....              | U. S. C. & G. S. ....         | 5,961        |
| Unimak .....                | U. S. C. & G. S. ....         | 8,954        |
| Verstooa .....              | U. S. C. & G. S. ....         | 3,374        |
| Vesvidoff .....             | U. S. C. & G. S. ....         | 8,868        |

# ARIZONA.

| Station.                       | Authority.                  | Elevation.     |
|--------------------------------|-----------------------------|----------------|
|                                |                             | <i>Fet.</i>    |
| Acorn Spring .....             | Powell .....                | 6,360          |
| Adonde .....                   | S. P. R. R. of Ariz .....   | 214            |
| Agua Prieta .....              |                             | 4,017          |
| Allentown .....                | A. & P. R. R. ....          | 6,026          |
| Angell .....                   | A. & P. R. R. ....          | 5,879          |
| Antelope Springs .....         | Wheeler .....               | 8,065          |
| Anvil Rock .....               | Wheeler .....               | 5,354          |
| Apache Camp .....              | Wheeler .....               | 5,000          |
| "    Signal Station .....      | U. S. Signal Office .....   | 5,004          |
| Apache Spring .....            | Wheeler .....               | 6,124          |
| Arch Spring .....              | Toner .....                 | 6,350          |
| Ash Fork .....                 | A. & P. R. R. ....          | 5,105          |
| Aspen Spring .....             |                             | 7,381          |
| Aubrey .....                   | A. & P. R. R. ....          | 5,128          |
| Aubrey Cliffs .....            | Powell .....                | 7,330          |
| Aubrey Valley .....            | Toner .....                 | 5,156          |
| Beale .....                    | A. & P. R. R. ....          | 3,472          |
| Beale's Pass .....             | R. P. R. R. surveys .....   | 2,127          |
| Bear Springs .....             |                             | 4,264          |
| Bellefonte .....               | A. & P. R. R. ....          | 7,099          |
| Benson .....                   | S. P. R. R. ....            | 3,580          |
| Benson Junction .....          | A. T. & S. F. R. ....       | 3,521          |
| Big Cañon .....                |                             | 1,426          |
| Billings .....                 | A. & P. R. R. ....          | 5,372          |
| Bill Williams Mt .....         | Ives .....                  | 6,620          |
| Bitter Spring .....            | Powell .....                | 4,890          |
| Bitter Spring Peak .....       | Powell .....                | 6,700          |
| Blue Spring .....              | Wheeler .....               | 7,796          |
| Bowers' Ranch .....            | Wheeler .....               | 4,412          |
| Bowie .....                    | S. P. R. R. ....            | 3,761          |
| Bowie, Camp .....              | Wheeler .....               | 4,872          |
| Brookline .....                | A. T. & S. F. R. R. ....    | 4,462          |
| Buchanan, Fort .....           | Med. Dpt. U. S. A. ....     | 5,330          |
| Bush's Ranch .....             | Wheeler .....               | 7,704          |
| Cactus .....                   | S. P. R. R. ....            | 4,224          |
| Canby, Fort .....              | Med. Dept., U. S. A. ....   | 6,500          |
| Canister .....                 | A. T. & S. F. R. R. ....    | 3,618          |
| Cañon Springs .....            | Wheeler .....               | 5,498          |
| Cariso, Mt .....               | Hayden .....                | 9,280          |
| Carrizo .....                  | A. & P. R. R. ....          | 5,199          |
| Casa Grande .....              | S. P. R. R. of Ariz .....   | 1,398          |
| Cave Spring .....              | Wheeler .....               | 6,031          |
| Cedar Forest .....             |                             | 5,808          |
| Chalender .....                | A. & P. R. R. ....          | 6,837          |
| Chino .....                    | A. & P. R. R. ....          | 5,224          |
| Chloride .....                 | Wheeler .....               | 4,201          |
| Cienega .....                  | Wheeler .....               | 7,476          |
| Cienega De San Simon .....     | Wheeler .....               | 3,855          |
| Colorado Chiquito Bridge ..... | Wheeler .....               | 5,638          |
| Colorado Plateau .....         | Powell .....                | 6,000 to 8,000 |
| Cooley's Ranch .....           | Wheeler .....               | 5,367          |
| Contention .....               | A. T. & S. F. R. R. ....    | 3,771          |
| Cosnino .....                  | A. & P. R. R. ....          | 6,434          |
| Cosnino Caves .....            | Wheeler .....               | 6,244          |
| " .....                        | Pacific R. R. Reports ..... | 6,139          |
| Cottonwood Spring .....        | Wheeler .....               | 4,170          |
| Coyote Spring .....            | Wheeler .....               | 6,874          |

| Station.                                   | Authority.                  | Elevation.   |
|--------------------------------------------|-----------------------------|--------------|
|                                            |                             | <i>Feet.</i> |
| Criswell's Ranch .....                     | Wheeler .....               | 5,772        |
| Crittenden .....                           | A. T. & S. F. R. R. ....    | 4,172        |
| Crookton .....                             | A. & P. R. R. ....          | 5,657        |
| Cross Mt. ....                             | Petermann .....             | 5,182        |
| Crown Point .....                          | Powell .....                | 7,140        |
| Date Creek, Camp .....                     | Toner .....                 | 3,726        |
| Deer Spring .....                          | Wheeler .....               | 5,981        |
| Defiance, Fort .....                       | U. S. Geol. Survey .....    | 6,862        |
| Demotte Park .....                         | Powell .....                | 5,800-6,000  |
| Dennison .....                             | A. & P. R. R. ....          | 4,979        |
| Desert Station .....                       | Wheeler .....               | 2,135        |
| Desert Tanks .....                         | Wheeler .....               | 5,192        |
| Diablo Cañon .....                         | Toner .....                 | 4,765        |
| Duffer Crag .....                          | Powell .....                | 6,500        |
| Echo Peak .....                            | Powell .....                | 5,360        |
| Elgin .....                                | A. T. & S. F. R. R. ....    | 4,690        |
| El Puerto del Dado Pass .....              | Petermann .....             | 5,433        |
| Ecuadorilla Mountain .....                 | Wheeler .....               | 10,691       |
| Estrella .....                             | S. P. R. R. of Ariz. ....   | 1,523        |
| Fairbank Junction .....                    | A. T. & S. F. R. R. ....    | 3,828        |
| Fairview .....                             | A. & P. R. R. ....          | 5,909        |
| Flagstaff .....                            | A. P. R. R. ....            | 6,862        |
| Florence, Signal Station .....             | U. S. Signal Office .....   | 1,553        |
| Gila City .....                            | S. P. R. R. of Ariz. ....   | 175          |
| Gila Bend .....                            | S. P. R. R. of Ariz. ....   | 739          |
| Gnome Waterpocket (Wainupits Pikavu) ..... | Powell .....                | 5,390        |
| Goodwin, Camp (old) .....                  | Wheeler .....               | 2,816        |
| Graham Mountain .....                      | Wheeler .....               | 10,516       |
| Grant, Camp .....                          | Wheeler .....               | 4,833        |
| Grant, Old Camp .....                      | Wheeler .....               | 2,118        |
| Grant, Signal Station .....                | U. S. Signal Office .....   | 4,737        |
| Green's Peak .....                         | Wheeler .....               | 10,093       |
| Hackberry .....                            | A. & P. R. R. ....          | 3,522        |
| Ha-pa-ka-va'-te Spring .....               | Powell .....                | 6,840        |
| Hardy .....                                | A. & P. R. R. ....          | 4,910        |
| Hart's Ranch .....                         | Powell .....                | 8,070        |
| Hatch Wells .....                          | Powell .....                | 5,290        |
| Holbrook .....                             | A. & P. R. R. ....          | 5,047        |
| Hope, Mt. ....                             | Peterson .....              | 6,321        |
| House Rock Spring .....                    | Powell .....                | 5,730        |
| Huachuca .....                             | A. T. & S. F. R. R. ....    | 4,253        |
| Hualapai .....                             | A. & P. R. R. ....          | 3,277        |
| Hualapais, Camp .....                      | Wheeler .....               | 5,322        |
| Hualapais Spring .....                     | Wheeler .....               | 4,258        |
| Humphreys' Peak .....                      | Wheeler .....               | 12,562       |
| Jacob's Pool Point .....                   | Powell .....                | 6,890        |
| Jacob's Pools .....                        | Powell .....                | 5,260        |
| Jacob's Well .....                         | Pacific R. R. Reports ..... | 5,973        |
| Do .....                                   | Wheeler .....               | 6,065        |
| Jaycock's Ranch .....                      | Wheeler .....               | 6,814        |
| Kaibab Plateau .....                       | Wheeler .....               | 8,000        |
| Kanab Plateau .....                        | Powell .....                | 5,000-6,400  |
| Kane Spring .....                          | Powell .....                | 3,686        |
| Kerlin's Well .....                        | Powell .....                | 5,502        |
| Kingman .....                              | A. & P. R. R. ....          | 3,303        |
| Kisaha Waterpocket .....                   | Powell .....                | 5,980        |
| La Pilla .....                             | Wheeler .....               | 5,850        |
| Law's Spring .....                         | Powell .....                | 6,870        |
| Lee's Ferry .....                          | Powell .....                | 3,170        |
| Leroux Springs .....                       | Pacific R. R. Reports ..... | 7,378        |
| Limestone Spring .....                     | Wheeler .....               | 5,680        |
| Limestone Tanks .....                      | Powell .....                | 5,040        |
| Limestone Water-pocket .....               | Wheeler .....               | 5,405        |
| Little Colorado River (mouth of) .....     | Powell .....                | 2,690        |



| Station.                          | Authority.                 | Elevation.   |
|-----------------------------------|----------------------------|--------------|
|                                   |                            | <i>Feet.</i> |
| Lockwood Spring .....             | Wheeler.....               | 5,526        |
| Los Lente.....                    | Wheeler.....               | 6,542        |
| Los Nogales.....                  | .....                      | 3,836        |
| Lowell, Camp.....                 | Wheeler.....               | 2,000        |
| McPherson, Camp.....              | Med. Dept., U. S. A.....   | 3,726        |
| Maricopa.....                     | S. P. R. R. of Ariz.....   | 1,188        |
| Maricopa Wells.....               | Pacific R. R. Reports..... | 1,270        |
| Mescal.....                       | S. P. R. R.....            | 4,036        |
| Mineral Spring.....               | Wheeler.....               | 6,670        |
| Mi-shong-i-ni-vi (base of).....   | Powell.....                | 5,558        |
| Moa Ava.....                      | Powell.....                | 4,705        |
| Moencopie.....                    | Powell.....                | 4,710        |
| Mohawk Summit.....                | S. P. R. R. of Ariz.....   | 543          |
| Moicava Settlement.....           | Powell.....                | 4,700        |
| Mojave, Camp.....                 | Wheeler.....               | 755          |
| Do.....                           | Med. Dept., U. S. A.....   | 604          |
| Do.....                           | Pacific R. R. Reports..... | 605          |
| Mogollon Mesa.....                | Wheeler.....               | 7,535        |
| Mooshaneh.....                    | Ives.....                  | 5,890        |
| Mountain Spring.....              | .....                      | 5,500        |
| Do.....                           | Powell.....                | 3,198        |
| Musha Lake.....                   | Powell.....                | 5,380        |
| Music Mt.....                     | Powell.....                | 6,580        |
| Navajo Mt.....                    | Powell.....                | 10,038       |
| Navajo Springs.....               | A. & P. R. R.....          | 5,605        |
| Do.....                           | Powell.....                | 4,155        |
| Do.....                           | Wheeler.....               | 4,101        |
| Do.....                           | Wheeler.....               | 5,666        |
| Do.....                           | Pacific R. R. Reports..... | 5,626        |
| Navajo Spring.....                | Powell.....                | 5,800        |
| Nelson Tanks.....                 | Wheeler.....               | 6,216        |
| Now Year's Spring.....            | Ives.....                  | 6,739        |
| Nogales.....                      | A. T. & S. F. R. R.....    | 3,813        |
| Nugent's Pass.....                | K. P. R. R. surveys.....   | 4,686        |
| Do.....                           | T. & P. R. R. surveys..... | 4,820        |
| Oak Spring.....                   | Powell.....                | 6,359        |
| Octoa.....                        | S. P. R. R.....            | 4,104        |
| Ojo de San Luis.....              | .....                      | 5,044        |
| Oraibi Peak.....                  | Powell.....                | 6,700        |
| Oraibi Spring.....                | Powell.....                | 5,950        |
| Oraibi.....                       | Wheeler.....               | 4,757        |
| Do.....                           | Powell.....                | 6,009        |
| Do.....                           | Ives.....                  | 5,816        |
| Do Garden.....                    | Ives.....                  | 6,395        |
| Ord Peak.....                     | Wheeler.....               | 10,266       |
| Oval Butte.....                   | Powell.....                | 5,410        |
| Pahghun-pahghun Springs.....      | .....                      | 2,282        |
| Painted Cañon, entrance.....      | Wheeler.....               | 746          |
| Painted Rock.....                 | S. P. R. R. of Ariz.....   | 728          |
| Palo Verde.....                   | A. & P. R. R.....          | 1,065        |
| Pantano.....                      | S. P. R. R. of Ariz.....   | 3,538        |
| Papago.....                       | S. P. R. R. of Ariz.....   | 3,012        |
| Parapet Plateau.....              | Powell.....                | 4,000-7,000  |
| Paria Plateau (eastern edge)..... | Powell.....                | 7,276        |
| Do.....                           | Powell.....                | 6,000-7,300  |
| Paria Spring.....                 | Wheeler.....               | 6,896        |
| Park Spring.....                  | Toner.....                 | 7,199        |
| Peach Orchard Spring.....         | Wheeler.....               | 6,272        |
| Peach Spring.....                 | A. & P. R. R.....          | 4,759        |
| Peach-tree Spring.....            | Powell.....                | 4,110        |
| Peacock Spring.....               | Toner.....                 | 3,174        |
| Pearl Spring.....                 | Toner.....                 | 5,315        |
| Phenix, Signal Station.....       | U. S. Signal Office.....   | 1,068        |

| Station.                              | Authority.                  | Elevation.   |
|---------------------------------------|-----------------------------|--------------|
|                                       |                             | <i>Feet.</i> |
| Phippeny Spring .....                 | Powell .....                | 3,690        |
| Picacho .....                         | S. P. R. R. of Ariz. ....   | 1,618        |
| Do .....                              | Wheeler .....               | 1,750        |
| Picacho Peak .....                    | Potermann .....             | 4,754        |
| Picacho Spring .....                  | .....                       | 4,870        |
| Picket Post .....                     | Wheeler .....               | 2,669        |
| Pimas Villages .....                  | .....                       | 1,440        |
| Pine Tanks .....                      | Wheeler .....               | 5,648        |
| Pinneveta .....                       | A. & P. R. R. ....          | 5,084        |
| Pipe Spring .....                     | Powell .....                | 4,890        |
| Pipe Spring Point .....               | Powell .....                | 6,560        |
| Pipo Springs .....                    | Wheeler .....               | 5,397        |
| Playa de los Pimas .....              | Toner .....                 | 4,149        |
| Polliwog Spring .....                 | Powell .....                | 4,500        |
| Pottery Hill .....                    | Ives .....                  | 5,722        |
| Powell .....                          | A. & P. R. R. ....          | 418          |
| Prescott .....                        | Wheeler .....               | 5,316        |
| Prieto Crossing .....                 | Wheeler .....               | 5,332        |
| Pueblo Colorado .....                 | Wheeler .....               | 6,401        |
| Pueblo Vieja .....                    | Wheeler .....               | 2,712        |
| Quercus Cañon .....                   | Mexican Boundary Survey ..  | 4,170        |
| Rachel Butte .....                    | Powell .....                | 6,720        |
| Railroad Pass .....                   | Ives .....                  | 3,764        |
| Do .....                              | K. P. R. R. surveys .....   | 4,356        |
| Do .....                              | T. & P. R. R. ....          | 4,490        |
| Railroad Pass Station .....           | S. P. R. R. ....            | 4,396        |
| Rawlins, Camp (old) .....             | Wheeler .....               | 4,666        |
| Red Butte .....                       | Powell .....                | 7,690        |
| Red Mesa .....                        | Powell .....                | 5,510        |
| Red Rock .....                        | S. P. R. R. of Ariz. ....   | 1,867        |
| Relief Springs .....                  | Wheeler .....               | 5,526        |
| Rillito .....                         | S. P. R. R. of Ariz. ....   | 2,060        |
| Rock Spring .....                     | Wheeler .....               | 6,849        |
| Rock Spring, Fort .....               | .....                       | 4,972        |
| Runk's Pass .....                     | K. P. R. R. surveys .....   | 4,312        |
| Russell Point .....                   | Powell .....                | 7,280        |
| Russell's Tank .....                  | Toner .....                 | 5,285        |
| Sacaton .....                         | .....                       | 1,066        |
| Sacramento .....                      | A. & P. R. R. ....          | 2,587        |
| Safford .....                         | Wheeler .....               | 2,711        |
| Saint John's .....                    | Wheeler .....               | 5,650        |
| Saint Joseph .....                    | A. & P. R. R. ....          | 4,979        |
| Salt Spring .....                     | Wheeler .....               | 4,747        |
| San Carlos Agency .....               | Wheeler .....               | 2,456        |
| Sanders .....                         | A. & P. R. R. ....          | 5,807        |
| Sanford's .....                       | A. T. & S. F. R. R. ....    | 3,726        |
| San Francisco, Mt. ....               | P. R. R. Reports .....      | 12,052       |
| Do .....                              | Wheeler .....               | 12,562       |
| Do .....                              | Wheeler .....               | 10,122       |
| Do .....                              | Wheeler .....               | 11,468       |
| San Francisco Spring .....            | Pacific R. R. Reports ..... | 6,666        |
| San Simon .....                       | S. P. R. R. Reports .....   | 3,611        |
| Sentinel .....                        | S. P. R. R. of Ariz. ....   | 690          |
| Shi-wits Plateau .....                | .....                       | 7,000        |
| Do .....                              | Powell .....                | 5,800-6,200  |
| Shungo-pah-we .....                   | Wheeler .....               | 6,032        |
| Sichoamavi .....                      | Powell .....                | 6,070        |
| Sierra Blanca, (timber line on) ..... | .....                       | 11,100       |
| Signal Peak .....                     | Wheeler .....               | 9,330        |
| Silver Spring .....                   | Wheeler .....               | 6,169        |
| Sitgreaves Pass .....                 | Ives .....                  | 3,652        |
| Skull Valley, Camp .....              | Med. Dept., U. S. A. ....   | 5,000        |
| Sonoita .....                         | A. T. & S. F. R. R. ....    | 4,824        |

| Station.                   | Authority.                 | Elevation.   |
|----------------------------|----------------------------|--------------|
|                            |                            | <i>Feet.</i> |
| Spears' Ranch.....         | Wheeler.....               | 681          |
| Springerville.....         | Wheeler.....               | 6,862        |
| Stranwix.....              | S. P. R. R. of Ariz.....   | 567          |
| Steven's Ranch.....        | Powell.....                | 4,650        |
| Summit Spring.....         | Wheeler.....               | 7,867        |
| Sunset Crossing.....       | Wheeler.....               | 4,891        |
| Sunset Gap.....            | Wheeler.....               | 5,755        |
| Sunset Tanks.....          | Wheeler.....               | 5,797        |
| Supai.....                 | A. & P. R. R.....          | 6,917        |
| Sweet Water.....           | S. P. R. R. of Ariz.....   | 1,298        |
| Taylor, Mt.....            | Wheeler.....               | 11,200       |
| Tegua.....                 | Powell.....                | 6,035        |
| Do.....                    | Wheeler.....               | 6,299        |
| Terra.....                 | Powell.....                | 6,070        |
| Texas Hill.....            | S. P. R. R. of Ariz.....   | 355          |
| Thomas Peak.....           | Wheeler.....               | 11,496       |
| Thompson's Spring.....     | Powell.....                | 4,980        |
| Thousand Wells.....        | Powell.....                | 5,399        |
| Tipton Mesa.....           | Powell.....                | 6,680        |
| Tipton Peak.....           | Wheeler.....               | 7,364        |
| Tonto Pass.....            | A. & P. R. R. surveys..... | 7,529        |
| Toroweap Valley.....       | Powell.....                | 4,550        |
| Trident Point.....         | Powell.....                | 6,760        |
| Trumbull, Mt.....          | Powell.....                | 8,360        |
| Truxton.....               | A. & P. R. R.....          | 4,172        |
| Truxton Springs.....       | Wheeler.....               | 3,885        |
| Tubac.....                 | Toner.....                 | 3,000        |
| Tucson.....                | S. P. R. R. of Ariz.....   | 2,392        |
| Do.....                    | Wheeler.....               | 2,538        |
| Do. Signal Station.....    | U. S. Signal Office.....   | 2,404        |
| Tull Spring.....           | Wheeler.....               | 5,861        |
| Uinkaret Plateau.....      | Powell.....                | 5,400-6,100  |
| Union Pass.....            | Wheeler.....               | 3,600        |
| Val de Chino.....          | Pacific R. R. Reports..... | 5,754        |
| Verde, Camp.....           | Wheeler.....               | 3,160        |
| Vigil's Ranch.....         | Wheeler.....               | 5,875        |
| Volunteer Spring.....      | Wheeler.....               | 7,106        |
| Wag-a-thi-le Spring.....   | Powell.....                | 6,040        |
| Wallipi Pass.....          | K. P. R. R. surveys.....   | 3,473        |
| Walpi.....                 | Powell.....                | 6,070        |
| Washington Pass.....       | Wheeler.....               | 8,825        |
| Washi-pahghum Springs..... | .....                      | 4,421        |
| Whipple, Fort.....         | Wheeler.....               | 5,318        |
| Do.....                    | Pacific R. R. Reports..... | 5,335        |
| Whipple Pass.....          | K. P. R. R. surveys.....   | 7,206        |
| White Rock Spring.....     | Wheeler.....               | 6,301        |
| White's Ranch.....         | .....                      | 1,202        |
| Whitlock's Cienega.....    | Wheeler.....               | 3,580        |
| Willcox.....               | S. P. R. R.....            | 4,166        |
| Williams.....              | A. & P. R. R.....          | 6,727        |
| Williams' Ranch.....       | Wheeler.....               | 7,487        |
| Willow Grove.....          | .....                      | 4,170        |
| Willow Spring.....         | Wheeler.....               | 7,294        |
| Winslow.....               | A. & P. R. R.....          | 4,825        |
| Wonsit's Plain.....        | Powell.....                | 4,500-5,000  |
| Yampai.....                | A. & P. R. R.....          | 5,552        |
| Yampa Junction.....        | .....                      | 5,369        |
| Yucca.....                 | A. & P. R. R.....          | 1,774        |
| Yuma.....                  | S. P. R. R.....            | 142          |
| Do. Signal Station.....    | U. S. Signal Office.....   | 141          |

# ARKANSAS.

| Station.                                     | Authority.                    | Elevation.   |
|----------------------------------------------|-------------------------------|--------------|
|                                              |                               | <i>Feet.</i> |
| Alexander.....                               | St. L., I. Mt. & S. R. R..... | 330          |
| Alicia.....                                  | Toner.....                    | 244          |
| Alma.....                                    | L. R. & Ft. S. R. R.....      | 477          |
| Altus.....                                   | L. R. & Ft. S. R. R.....      | 581          |
| Argenta.....                                 | M. & L. R. R. R.....          | 301          |
| Arkadelphia.....                             | St. L., I. Mt. & S. R. R..... | 191          |
| Atkins.....                                  | L. R. & Ft. S. R. R.....      | 399          |
| Austin.....                                  | St. L., I. Mt. & S. R. R..... | 258          |
| Baring Cross.....                            | Toner.....                    | 246          |
| Beebe.....                                   | St. L., I. Mt. & S. R. R..... | 250          |
| Benton.....                                  | St. L., I. Mt. & S. R. R..... | 283          |
| Bentonville.....                             | Smithsonian Inst.....         | 1,790        |
| Bradford.....                                | St. L., I. Mt. & S. R. R..... | 246          |
| Brinkley.....                                | M. & L. R. R. R.....          | 200          |
| Buckhorn.....                                | Smithsonian Inst.....         | 650          |
| Cabin Creek.....                             | L. R. & Ft. S. R. R.....      | 449          |
| Cabot.....                                   | Toner.....                    | 279          |
| Camden.....                                  | Toner.....                    | 123          |
| Campbell.....                                | Toner.....                    | 223          |
| Carrollton.....                              | Toner.....                    | 1,412        |
| Clarksville.....                             | L. R. & Ft. S. R. R.....      | 409          |
| Coal Hill.....                               | L. R. & Ft. S. R. R.....      | 510          |
| Conway.....                                  | L. R. & Ft. S. R. R.....      | 361          |
| Corning.....                                 | St. L., I. Mt. & S. R. R..... | 294          |
| Delaplaine.....                              | Toner.....                    | 268          |
| Devall's Bluff.....                          | M. & L. R. R. R.....          | 181          |
| Fayetteville.....                            | Toner.....                    | 1,350        |
| Flippen's Barrens.....                       | Smithsonian Inst.....         | 1,000        |
| Forrest City.....                            | M. & L. R. R. R.....          | 281          |
| Fort Smith.....                              | L. R. & Ft. S. R. R.....      | 467          |
| Fulton, Red River Bridge.....                | St. L., I. Mt. & S. R. R..... | 272          |
| Gaines' Landing.....                         | Toner.....                    | 149          |
| Gainesville.....                             | Toner.....                    | 500          |
| Garner.....                                  | Toner.....                    | 211          |
| Gatlin.....                                  | L. R. & Ft. S. R. R.....      | 451          |
| Germantown.....                              | L. R. & Ft. S. R. R.....      | 353          |
| Grand Glaize.....                            | St. L., I. Mt. & S. R. R..... | 226          |
| Gurdon.....                                  | St. L., I. Mt. & S. R. R..... | 213          |
| Higginson.....                               | Toner.....                    | 210          |
| Holland.....                                 | Toner.....                    | 243          |
| Hope.....                                    | St. L., I. Mt. & S. R. R..... | 357          |
| Hopefield, opp. Memphis.....                 | M. & L. R. R. R.....          | 218          |
| Do.....extreme h. w. in Mississippi Riv..... |                               | 217          |
| Horsehead.....                               | L. R. & Ft. S. R. R.....      | 404          |
| Hot Springs.....                             | Toner.....                    | 718          |
| Jacksonport.....                             | Toner.....                    | 214          |
| Jacksonville.....                            | St. L., I. Mt. & S. R. R..... | 287          |
| Jamison.....                                 | L. R. & Ft. S. R. R.....      | 330          |
| Judsonia.....                                | St. L., I. Mt. & S. R. R..... | 222          |
| Kensett.....                                 | St. L., I. Mt. & S. R. R..... | 229          |
| Knobel.....                                  | Toner.....                    | 271          |
| Knoxville.....                               | L. R. & Ft. S. R. R.....      | 437          |
| La Anguille.....                             | M. & L. R. R. R.....          | 210          |
| La Honda.....                                | Pacific R. R. Reports.....    | 632          |
| Little Rock.....                             | St. L., I. Mt. & S. R. R..... | 263          |
| Do.....Signal Station.....                   | U. S. Signal Office.....      | 298          |
| Lockhart's.....                              | Toner.....                    | 242          |

| Station.                                | Authority.                     | Elevation.   |
|-----------------------------------------|--------------------------------|--------------|
|                                         |                                | <i>Feet.</i> |
| London .....                            | L. R. & Ft. S. R. R. ....      | 406          |
| McAlmont .....                          | Toner .....                    | 263          |
| McLean's Landing .....                  | Toner .....                    | 360          |
| Madison, on St. Francis Bridge.....     | M. & L. R. R. R. ....          | 213          |
| Do .. town proper .....                 | .....                          | 207          |
| Malvern .....                           | St. L., I. Mt. & S. R. R. .... | 277          |
| Mineral Spring .....                    | Toner .....                    | 600          |
| Minturn Spring .....                    | Toner .....                    | 251          |
| Moark .....                             | Toner .....                    | 287          |
| Montana .....                           | L. R. & Ft. S. R. R. ....      | 432          |
| Morrilton .....                         | L. R. & Ft. S. R. R. ....      | 393          |
| Mulberry .....                          | L. R. & Ft. S. R. R. ....      | 430          |
| Murta .....                             | Toner .....                    | 261          |
| Napoleon .....                          | Pacific R. R. Reports .....    | 142          |
| Newport .....                           | St. L., I. Mt. & S. R. R. .... | 232          |
| O'Kean .....                            | St. L., I. Mt. & S. R. R. .... | 276          |
| Olyphant .....                          | Toner .....                    | 215          |
| Onita .....                             | L. R. & Ft. S. R. R. ....      | 386          |
| Ozark .....                             | L. R. & Ft. S. R. R. ....      | 424          |
| Palarmi .....                           | L. R. & Ft. S. R. R. ....      | 311          |
| Peach Orchard .....                     | St. L., I. Mt. & S. R. R. .... | 290          |
| Pittsburg .....                         | Toner .....                    | 418          |
| Plummerville .....                      | L. R. & Ft. S. R. R. ....      | 333          |
| Prescott .....                          | St. L., I. Mt. & S. R. R. .... | 328          |
| Preston .....                           | .....                          | 790          |
| Rockport .....                          | Toner .....                    | 264          |
| Russellville .....                      | L. R. & Ft. S. R. R. ....      | 391          |
| Smith, Fort .....                       | Med. Dept., U. S. A. ....      | 460          |
| Spadra .....                            | L. R. & Ft. S. R. R. ....      | 422          |
| Spring Hill .....                       | Smithsonian Inst .....         | 188          |
| Swifton .....                           | St. L., I. Mt. & S. R. R. .... | 253          |
| Texarkana .....                         | St. L., I. Mt. & S. R. R. .... | 303          |
| Do .... (June. T. & J. Div. T. & P.) .. | T. & P. R. R. ....             | 358          |
| Van Buren .....                         | L. R. & Ft. S. R. R. ....      | 449          |
| Do .... h. w. Arkansas River, 1866) ..  | L. R. & Ft. S. R. R. ....      | 450          |
| Do .... (l. w. Arkansas River, 1878) .. | L. R. & Ft. S. R. R. ....      | 423          |
| Walnut Ridge .....                      | St. L., I. Mt. & S. R. R. .... | 275          |
| Ward .....                              | Toner .....                    | 231          |
| Warren .....                            | L. R. & Ft. S. R. R. ....      | 331          |
| Washington .....                        | Smithsonian Inst .....         | 660          |
| White Oak .....                         | L. R. & Ft. S. R. R. ....      | 435          |

# CALIFORNIA.

| Station.                           | Authority.            | Elevation.   |
|------------------------------------|-----------------------|--------------|
|                                    |                       | <i>Feet.</i> |
| Abbey Hill.....                    | U. S. C. & G. S.....  | 1,232        |
| Abbott.....                        | U. S. C. & G. S.....  | 375          |
| Acampo.....                        | .....                 | 59           |
| Adalante.....                      | Cal. P. R. R.....     | 76           |
| Adams, Mt.....                     | Wheeler.....          | 8,431        |
| Adobe.....                         | Wheeler.....          | 232          |
| Adobe Meadows.....                 | Wheeler.....          | 6,594        |
| Agua Caliente.....                 | Emory.....            | 3,013        |
| Do.....                            | Wheeler.....          | 725          |
| Do.....                            | Wheeler.....          | 3,617        |
| Alamo Mocho.....                   | P. R. R. Reports..... | — 70         |
| Alcatraz Island.....               | U. S. C. & G. S.....  | 143          |
| Algodones.....                     | P. R. R. Reports..... | 46           |
| Alpine.....                        | C. P. R. R.....       | 2,822        |
| Alta.....                          | C. P. R. R.....       | 3,607        |
| Altamont.....                      | C. P. R. R.....       | 740          |
| Alturas.....                       | Wheeler.....          | 4,305        |
| Alturas Hill.....                  | Wheeler.....          | 4,459        |
| Amy's Ranch.....                   | Wheeler.....          | 1,494        |
| Anaheim.....                       | C. P. R. R.....       | 130          |
| Anderson.....                      | Toner.....            | 33           |
| Anderson, Mt.....                  | Whitney.....          | 9,000        |
| Angel Island, N. W.....            | U. S. C. & G. S.....  | 159          |
| Angel Island Peak.....             | U. S. C. & G. S.....  | 782          |
| Aneta.....                         | Toner.....            | 161          |
| Antelope.....                      | C. P. R. R.....       | 154          |
| Antelope Ranch.....                | Wheeler.....          | 359          |
| Antelope Spring.....               | Wheeler.....          | 4,272        |
| Arab Spring.....                   | Wheeler.....          | 5,697        |
| Arcade.....                        | C. P. R. R.....       | 55           |
| Arlington Bridge.....              | Wheeler.....          | 3,375        |
| Ash Springs.....                   | Wheeler.....          | 1,810        |
| Anburn.....                        | C. P. R. R.....       | 1,360        |
| Do.....                            | Smithsonian Inst..... | 1,176        |
| Aurora.....                        | Wheeler.....          | 7,449        |
| Advisadera, Point.....             | U. S. C. & G. S.....  | 171          |
| Azusa.....                         | Wheeler.....          | 594          |
| Babbitt, Camp.....                 | Williamson.....       | 384          |
| Bache, Mt.....                     | U. S. C. & G. S.....  | 3,793        |
| Do.....                            | Petermann.....        | 3,790        |
| Bacon's Ranch.....                 | Wheeler.....          | 4,076        |
| Bagley's Ranch.....                | Wheeler.....          | 5,387        |
| Bah-li-vah Spring.....             | Wheeler.....          | 6,284        |
| Bakersfield.....                   | Wheeler.....          | 432          |
| Baker's Ranch.....                 | Toner.....            | 3,285        |
| Bald Mountain.....                 | Wheeler.....          | 5,829        |
| Do.....                            | Wheeler.....          | 8,295        |
| Bald Rock.....                     | Wheeler.....          | 7,825        |
| Balley, Mt.....                    | Whitney.....          | 6,357        |
| Ballona.....                       | L. A. & I. R. R.....  | 103          |
| Bantas.....                        | C. P. R. R.....       | 30           |
| Bardins.....                       | Monterey R. R.....    | 48           |
| Bare Mountain.....                 | Wheeler.....          | 6,039        |
| Bares' Ranch, Surprise Valley..... | Wheeler.....          | 4,680        |
| Barker's Ranch.....                | Wheeler.....          | 594          |
| Barnard's Hotel.....               | Wheeler.....          | 3,851        |
| Batavia.....                       | C. P. R. R.....       | 64           |
| Battle Creek Meadows.....          | Wheeler.....          | 4,700        |

| Station.                                  | Authority.               | Elevat |
|-------------------------------------------|--------------------------|--------|
| Battle Hill.....                          |                          | 1      |
| Baxter's Station.....                     |                          | 2      |
| Bear Valley P. O.....                     | Wheeler.....             | 4      |
| Do..... Town Hotel.....                   | Wheeler.....             | 2      |
| Beckworth's Pass.....                     | Wheeler.....             | 6      |
| Do.....                                   | Wheeler.....             | 5      |
| Do.....                                   | E. R. surveys.....       | 4      |
| Beckworth's Store.....                    | Whitney.....             | 5      |
| Bell Mill.....                            | Wheeler.....             | 4      |
| Bello.....                                | Wheeler.....             | 3      |
| Benicia Arsenal.....                      | Cal. P. R. R.....        |        |
| Benicia Barracks.....                     | U. S. C. & G. S.....     |        |
| Bennett's Wells, Death Valley.....        | Med. Dept., U. S. A..... |        |
| Berenda.....                              | Wheeler.....             |        |
| Bidwell.....                              | Toner.....               |        |
| Bidwell Camp.....                         | Wheeler.....             | 4      |
| Do.....                                   | Wheeler.....             | 4      |
| Bidwell, Mt.....                          | Med. Dept., U. S. A..... | 4      |
| Bidwell's Bar, South Fork Feather River.. | Wheeler.....             | 8      |
| Bielowski.....                            | Wheeler.....             |        |
| Biggs's.....                              | Whitney.....             | 3      |
| Big Logan.....                            | C. P. R. R.....          |        |
| Big Meadow Ranch.....                     | Toner.....               |        |
| Big Meadows.....                          | Wheeler.....             | 6      |
| Big Oak Flat.....                         | Wheeler.....             | 4      |
| Big Springs.....                          | Wheeler.....             | 2      |
| Big Tree Grove, Calaveras County.....     | Wheeler.....             | 4      |
| Big Tree Station.....                     | Wheeler.....             | 3      |
| Birds' Springs.....                       | Wheeler.....             | 3      |
| Black Bluff.....                          | U. S. C. & G. S.....     |        |
| Black Mountain.....                       | U. S. C. & G. S.....     | 2      |
| Blackmore's Ranch.....                    | Wheeler.....             | 2      |
| Black Ridge.....                          | U. S. C. & G. S.....     |        |
| Black Springs.....                        | Wheeler.....             | 6      |
| Blodgett's Ranch.....                     | Wheeler.....             |        |
| Blood's Station.....                      | Wheeler.....             | 6      |
| Blue Cañon.....                           | Wheeler.....             | 4      |
| Bluff Point.....                          | C. P. R. R.....          |        |
| Board Ranch.....                          | U. S. C. & G. S.....     |        |
| Boca.....                                 | Wheeler.....             | 4      |
| Do.....                                   | Wheeler.....             | 5      |
| Bodega Head.....                          | C. P. R. R.....          | 5      |
| Bold's Ranch.....                         | U. S. C. & G. S.....     |        |
| Bonita, Point.....                        | Wheeler.....             |        |
| Boneyard Ranch.....                       | U. S. C. & G. S.....     | 2      |
| Boot-jack Ranch.....                      | Wheeler.....             | 2      |
| Borden.....                               | Wheeler.....             |        |
| Boston Peak.....                          | Toner.....               |        |
| Bower Cave.....                           | Wheeler.....             | 6      |
| Box Elder.....                            | Wheeler.....             | 2      |
| Boyd's Ranch.....                         | Wheeler.....             | 1      |
| Bozeman's Ranch.....                      | Wheeler.....             |        |
| Brandy City.....                          | Wheeler.....             | 3      |
| Breccia Pass.....                         | Wheeler.....             | 3      |
| Breckinridge, Mt.....                     | Goddard.....             | 10     |
| Breckenridge, Mt.....                     | Wheeler.....             | 5      |
| Brewer, Mt.....                           | Wheeler.....             | 7      |
| Brewery.....                              | Whitney.....             | 13     |
| Bridgeport.....                           | Wheeler.....             | 2      |
| Bridgeport P. O.....                      | Wheeler.....             | 1      |
| Brighton.....                             | Wheeler.....             | 6      |
| Brighton, Cross S. V. R. R.....           | S. & P. R. R.....        |        |
| Broncho.....                              | C. P. R. R.....          |        |
|                                           | Wheeler.....             | 5      |

| Station.                                 | Authority.                  | Elevation.   |
|------------------------------------------|-----------------------------|--------------|
|                                          |                             | <i>Feet.</i> |
| Brown's Flat .....                       | Wheeler .....               | 1,964        |
| Brown's Peak .....                       | Wheeler .....               | 5,392        |
| Brown's Ranch .....                      | Wheeler .....               | 1,759        |
| Buckeye .....                            | Wheeler .....               | 4,938        |
| Buckhorn Ranch (or Warren Station) ..... | Wheeler .....               | 693          |
| Buck's Ranch .....                       | Wheeler .....               | 5,112        |
| Buena Vista .....                        | Wheeler .....               | 323          |
| Do .....                                 | Nev. Co. N. G. R. R. ....   | 2,618        |
| Buena Vista Oil Works .....              | .....                       | 790          |
| Buffalo Station .....                    | Wheeler .....               | 4,378        |
| Burrows, Mt. ....                        | Wheeler .....               | 4,267        |
| Burst Rock .....                         | Wheeler .....               | 9,157        |
| Bush Hill .....                          | U. S. C. & G. S. ....       | 482          |
| Butte Creek Bridge .....                 | Wheeler .....               | 4,692        |
| Butte Creek House .....                  | Wheeler .....               | 5,758        |
| Butt, Mt. ....                           | Wheeler .....               | 7,830        |
| Byrnes' Ferry .....                      | Wheeler .....               | 380          |
| Cady, Camp .....                         | Wheeler .....               | 1,894        |
| Cahto .....                              | Smithsonian Inst. ....      | 2,000        |
| Cahuenga Pass .....                      | Wheeler .....               | 750          |
| Cajon Pass .....                         | Pacific R. R. Reports ..... | 4,676        |
| Cajon Pass Divide .....                  | Wheeler .....               | 4,195        |
| Cajon Ranch .....                        | Pacific R. R. Reports ..... | 412          |
| Calaveras Grove .....                    | Wheeler .....               | 4,730        |
| Caliente .....                           | C. P. R. R. ....            | 1,290        |
| Do .....                                 | Wheeler .....               | 1,314        |
| Caliente Springs .....                   | Wheeler .....               | 3,688        |
| California City Point .....              | U. S. C. & G. S. ....       | 75           |
| Calistoga .....                          | C. P. R. R. ....            | 331          |
| Campo, Signal Station .....              | U. S. Signal Office .....   | 2,527        |
| Camptonville .....                       | Toner .....                 | 2,388        |
| Camp Weldon (Mountain) .....             | Wheeler .....               | 2,716        |
| Canebrake Ranch .....                    | Wheeler .....               | 3,904        |
| Cannelas Ranch .....                     | Wheeler .....               | 799          |
| Cannon .....                             | C. P. R. R. ....            | 90           |
| Cañon de Turrucó Pass .....              | .....                       | 4,256        |
| Cañon Spring .....                       | Wheeler .....               | 1,238        |
| Cañon Station .....                      | Wheeler .....               | 2,650        |
| Capitan Grande .....                     | Pacific R. R. Reports ..... | 730          |
| Caples Ranch .....                       | Wheeler .....               | 7,790        |
| Caples Spring .....                      | Wheeler .....               | 5,512        |
| Carbondale .....                         | C. P. R. R. ....            | 222          |
| Caribou Bridge, North Fork .....         | Wheeler .....               | 2,843        |
| Carizzo .....                            | .....                       | 431          |
| Carlos, Mt. ....                         | Whitney .....               | 4,977        |
| Carmel, Mt. ....                         | U. S. C. & G. S. ....       | 4,415        |
| Carmelian Hot Springs .....              | Wheeler .....               | 6,237        |
| Carson Cañon Toll-house .....            | Wheeler .....               | 6,596        |
| Carson Pass .....                        | Goddard .....               | 7,972        |
| Do .....                                 | Whitney .....               | 8,759        |
| Do .....                                 | Wheeler .....               | 8,634        |
| Cartago .....                            | .....                       | 3,589        |
| Carthage, on Owens Lake .....            | Wheeler .....               | 3,589        |
| Cary, Mt. ....                           | Wheeler .....               | 9,970        |
| Cascade .....                            | C. P. R. R. ....            | 6,538        |
| Castle, Mt. ....                         | Wheeler .....               | 9,013        |
| Castle Peak .....                        | Whitney .....               | 12,500       |
| Castle Rock .....                        | Wheeler .....               | 9,872        |
| Castroville, on line of S. P. R. R. .... | Monterey R. R. ....         | 19           |
| Catharines .....                         | S. P. R. R. ....            | 512          |
| Cathedral Rock (lower) .....             | Wheeler .....               | 6,430        |
| Cathedral Rock (higher) .....            | Wheeler .....               | 6,529        |
| Cathy's Ranch .....                      | Wheeler .....               | 1,200        |



| Station.                                   | Authority.                 | Elevat |
|--------------------------------------------|----------------------------|--------|
| Cavallos, Point de los.....                | U. S. C. & G. S.....       | 1      |
| Coyote Ridge.....                          | U. S. C. & G. S.....       | 1      |
| Cedar, Mt.....                             | Wheeler.....               | 8      |
| Cedar Point.....                           | Toner.....                 | 5      |
| Cedarville.....                            | Wheeler.....               | 4      |
| Centerville.....                           | Wheeler.....               |        |
| Cerro Gordo Landing, Col. River.....       | Wheeler.....               | 3      |
| Cerro Gordo Pass.....                      | Wheeler.....               | 8      |
| Chapman's Ranch.....                       | Wheeler.....               | 4      |
| Chapperal House.....                       | Wheeler.....               | 5      |
| Chemehuevis Pass.....                      | K. P. R. R. surveys.....   |        |
| Chico.....                                 | C. P. R. R.....            |        |
| Do.....                                    | Smithsonian Inst.....      |        |
| Do.....                                    | Wheeler.....               |        |
| Chinese Camp.....                          | Wheeler.....               | 1      |
| Chiquita Peak.....                         | Wheeler.....               | 8      |
| Chuckawalla.....                           | Wheeler.....               | 2      |
| Cicero.....                                | C. P. R. R.....            |        |
| Cienega.....                               | L. A. & I. R. R.....       |        |
| Cisco.....                                 | C. P. R. R.....            | 5      |
| Cisco (site) South Fork Yuba River.....    | Wheeler.....               | 5      |
| Clark Peak.....                            | Wheeler.....               | 11     |
| Clark's.....                               | Wheeler.....               | 3      |
| Clark's Ranch.....                         | Wheeler.....               | 4      |
| Clayton.....                               | Smithsonian Inst.....      |        |
| Clear Lake.....                            | Wheeler.....               | 5      |
| Clipper Gap.....                           | C. P. R. R.....            | 1      |
| Cloud Rest.....                            | Wheeler.....               | 9      |
| Clover Valley.....                         | Wheeler.....               | 3      |
| Cohen's Ranch.....                         | Wheeler.....               |        |
| Cohuilla Village.....                      | Pacific R. R. Reports..... |        |
| Colby's Ranch.....                         | Wheeler.....               | 4      |
| Cold Spring.....                           | Wheeler.....               | 3      |
| Do.....                                    | Wheeler.....               | 5      |
| Cold Spring Ranch.....                     | Wheeler.....               |        |
| Cole's Ranch.....                          | Wheeler.....               | 1      |
| Coleville (blacksmith shop).....           | Wheeler.....               | 5      |
| Colfax.....                                | Nev. Co. N. G. R. R.....   | 2      |
| Do.....                                    | Wheeler.....               | 3      |
| Colfax Junction, with Nevada Co. R. R..... | C. P. R. R.....            | 2      |
| Colona.....                                |                            |        |
| Colton.....                                | Wheeler.....               |        |
| Do.....                                    | C. P. R. R.....            |        |
| Columbia.....                              | Toner.....                 | 2      |
| Columbia P. O.....                         | Wheeler.....               | 2      |
| Columbia Rock (above valley).....          | Wheeler.....               | 5      |
| Conejos.....                               | Wheeler.....               | 2      |
| Conejos Ranch.....                         | Wheeler.....               |        |
| Conness Peak.....                          | Wheeler.....               | 12     |
| Contra Costa.....                          | U. S. C. & G. S.....       |        |
| Cook's Point (Mountain).....               | Wheeler.....               | 6      |
| Cook's Wells.....                          | Pacific R. R. Reports..... |        |
| Coomb's Station.....                       | Wheeler.....               | 2      |
| Cooper's Ranch.....                        | Wheeler.....               | 8      |
| Copperopolis P. O.....                     | Wheeler.....               | 1      |
| Corbett's Ranch.....                       | Wheeler.....               | 1      |
| Corcoran, Mt.....                          | Wheeler.....               | 14     |
| Cordelia.....                              | C. P. R. R.....            |        |
| Do.....                                    | Pacific R. R. Reports..... |        |
| Cory's Peak.....                           | Wheeler.....               | 11     |
| Costa.....                                 | C. P. R. R.....            |        |
| Cottonwood.....                            | Toner.....                 |        |
| Cottonwood Island.....                     | Wheeler.....               |        |

| Station.                           | Authority.                  | Elevation.   |
|------------------------------------|-----------------------------|--------------|
|                                    |                             | <i>Feet.</i> |
| Cottonwood Station .....           | Wheeler .....               | 2,488        |
| Coulterville .....                 | Wheeler .....               | 1,665        |
| Cow Creek Ranch, Sonora Road ..... | Wheeler .....               | 5,905        |
| Cow Head Lake .....                | Wheeler .....               | 6,041        |
| Cow Head Lake Spring .....         | Wheeler .....               | 5,329        |
| Cow Spring .....                   | Wheeler .....               | 3,876        |
| Cox's Ferry .....                  | Wheeler .....               | 250          |
| Crabtrees .....                    | Wheeler .....               | 934          |
| Crane Flat .....                   | Wheeler .....               | 6,054        |
| Crane Valley .....                 | Wheeler .....               | 3,185        |
| Crater Station .....               |                             | 1,000        |
| Crescent City .....                | Smithsonian Inst .....      | 12           |
| Do .....                           | Wheeler .....               | 3,306        |
| Cress's Ranch .....                | Wheeler .....               | 5,157        |
| Creston .....                      | C. P. R. R. ....            | 313          |
| Crinea House .....                 | Wheeler .....               | 1,221        |
| Crook, Fort .....                  | Med. Dept. U. S. A. ....    | 3,390        |
| Crow's Ranch, Clover Valley .....  | Wheeler .....               | 5,464        |
| Crytal Lake .....                  | R. R. Reports .....         | 5,907        |
| Culbertson's .....                 | Wheeler .....               | 980          |
| Culbertson's Vineyard .....        | Wheeler .....               | 981          |
| Cucamonga .....                    | C. P. R. R. ....            | 952          |
| Do .....                           | Wheeler .....               | 1,328        |
| Cucamonga Peak .....               | Wheeler .....               | 8,529        |
| Cucamonga Ranch .....              | Wheeler .....               | 1,168        |
| Cuddy's Ranch .....                | Wheeler .....               | 5,278        |
| Cunningham's Ranch .....           | Wheeler .....               | 387          |
| Curtis .....                       | C. P. R. R. ....            | 39           |
| Daggett's Pass .....               | Goddard .....               | 6,824        |
| Dahlonga .....                     | Wheeler .....               | 2,162        |
| Dalton's Ranch .....               | Wheeler .....               | 568          |
| Dana, Mt .....                     | Whitney .....               | 13,227       |
| Darwin Cañon .....                 | Wheeler .....               | 3,143        |
| Davis .....                        | C. P. R. R. ....            | 54           |
| Dawes Ranch .....                  | Wheeler .....               | 451          |
| Deadfall Bridge .....              | Wheeler .....               | 3,426        |
| Deadwood Peak .....                | Wheeler .....               | 4,451        |
| Decoto .....                       | C. P. R. R. ....            | 68           |
| Deep Spring .....                  | Wheeler .....               | 4,957        |
| Deer Creek .....                   | Wheeler .....               | 4,518        |
| Delaney's Ranch .....              | Wheeler .....               | 4,840        |
| Delano .....                       | C. P. R. R. ....            | 313          |
| Desert Springs .....               | Wheeler .....               | 1,989        |
| Deweer's Station .....             | Wheeler .....               | 2,922        |
| Devil's Peak .....                 | Wheeler .....               | 6,910        |
| Diablo Point .....                 | U. S. C. & G. S. ....       | 202          |
| Diablo, Monte, Hotel .....         | U. S. C. & G. S. ....       | 2,327        |
| Diablo, Monte .....                | U. S. C. & G. S. ....       | 3,849        |
| Dixon .....                        | C. P. R. R. ....            | 65           |
| Donner Lake .....                  | R. R. Reports .....         | 5,964        |
| Do .....                           | Wheeler .....               | 5,885        |
| Donner Pass .....                  | C. P. R. R. Surveys .....   | 7,901        |
| Do .....                           | Whitney .....               | 7,056        |
| Doon's Saw Mill .....              | Wheeler .....               | 3,420        |
| Dos Palmas .....                   | Wheeler .....               | 103          |
| Downey .....                       | C. P. R. R. ....            | 114          |
| Downieville .....                  | Smithsonian Inst .....      | 2,200        |
| Downieville Buttes .....           | Whitney .....               | 8,400        |
| Do .....                           | Wheeler .....               | 8,541        |
| Drew's Ranch .....                 | Wheeler .....               | 1,090        |
| Dribblesby's Ferry .....           | Pacific R. R. Reports ..... | 954          |
| Drum Barracks .....                | Med. Dept., U. S. A. ....   | 39           |
| Dudley's .....                     | Wheeler .....               | 2,959        |

| Station.                                     | Authority.                  | Elevat   |
|----------------------------------------------|-----------------------------|----------|
|                                              |                             | <i>F</i> |
| Duxbury .....                                | U. S. C. & G. S .....       |          |
| Dugan's .....                                | S. & P. R. R. ....          | 1,       |
| Dunderberg Peak .....                        | Wheeler .....               | 12,      |
| Dutch Flat .....                             | C. P. R. R. ....            | 3,       |
| Dutch Henry's Ranch .....                    | Wheeler .....               | 1,       |
| Dutch Hill Mining Camp .....                 | Wheeler .....               | 4,       |
| Dyer Mountain, near Big Meadows .....        | Wheeler .....               | 7,       |
| Eagle Lake .....                             | Wheeler .....               | 5,       |
| Eagle Mountain .....                         | Wheeler .....               | 9,       |
| Eagleville .....                             | Wheeler .....               | 4,       |
| Ebbitt's Pass .....                          | P. R. R. Reports .....      | 8,       |
| Echo Peak .....                              | Wheeler .....               | 11,      |
| Edgar's Spring .....                         | Wheeler .....               | 4,       |
| Eisen Vineyard .....                         | Wheeler .....               |          |
| Eldorado Mill .....                          | Wheeler .....               |          |
| Elephant, Mt. ....                           | Wheeler .....               | 10,      |
| Eleven Mile Station, Mariposa Road .....     | Wheeler .....               | 5,       |
| Eliot's Ranch, on Little Truckee River ..... | Wheeler .....               | 6,       |
| Elizabeth Lake .....                         | Wheeler .....               | 3,       |
| Elk Grove .....                              | C. P. R. R. ....            |          |
| Elk Horn .....                               | Pacific R. R. Reports ..... |          |
| Elkhorn Ranch .....                          | Wheeler .....               | 1,       |
| Elk Valley .....                             |                             | 3,       |
| Ellis .....                                  | C. P. R. R. ....            |          |
| Ellis Mountain .....                         | Wheeler .....               | 8,       |
| Elmira .....                                 | C. P. R. R. ....            |          |
| El Monte .....                               | Wheeler .....               |          |
| El Paso Mines .....                          | Wheeler .....               | 4,       |
| Emigrants' Gap .....                         | C. P. R. R. ....            | 5,       |
| Do .....                                     | Pacific R. R. Reports ..... | 5,       |
| Eureka .....                                 |                             | 5,       |
| Eureka Valley .....                          | Wheeler .....               | 5,       |
| Excelsior Hotel .....                        | Wheeler .....               | 4,       |
| Fandango Peak .....                          | Wheeler .....               | 7,       |
| Far West, Camp .....                         | Med. Dept., U. S. A. ....   |          |
| Fears' Station .....                         | Wheeler .....               | 3,       |
| Ferguson's Mill .....                        | Wheeler .....               | 1,       |
| Fifteen Mile Creek .....                     | Wheeler .....               | 1,       |
| Fisherman's Peak .....                       | Wheeler .....               | 14,      |
| Fish-pond Station .....                      | Toner .....                 | 1,       |
| Florence .....                               | C. P. R. R. ....            |          |
| Florin .....                                 | Toner .....                 |          |
| Folsom .....                                 | S. & P. R. R. ....          |          |
| Forest Ranch .....                           | Wheeler .....               | 2,       |
| Forgay's Ranch .....                         | Wheeler .....               | 3,       |
| Fornis' Ranch .....                          | Wheeler .....               | 4,       |
| Forsee's Ranch .....                         | Wheeler .....               | 3,       |
| Fort Point .....                             | U. S. C. & G. S. ....       |          |
| "Forty-nine," Cañon Pass .....               | Wheeler .....               | 6,       |
| Foster's Bar .....                           | Toner .....                 | 1,       |
| Foster's Station .....                       | Wheeler .....               | 3,       |
| Fowler's Peak .....                          | Wheeler .....               | 1,       |
| Francis' Spring .....                        | Wheeler .....               | 4,       |
| Frank's Lagoon .....                         | U. S. C. & G. S. ....       |          |
| Fredonyer's Peak .....                       | Wheeler .....               | 7,       |
| Freels' Mountain .....                       | Wheeler .....               | 10,      |
| Fremont .....                                | C. P. R. R. ....            |          |
| Frenchman's Cove .....                       | Wheeler .....               | 5,       |
| Fresno .....                                 | C. P. R. R. ....            |          |
| Do .....                                     | Wheeler .....               |          |
| Fresno Flat .....                            | Wheeler .....               | 2        |
| Fryes' .....                                 | Wheeler .....               | 2        |
| Fulsom & Hall's Ranch .....                  | Wheeler .....               | 4        |

| Station.                                  | Authority.                  | Elevation.   |
|-------------------------------------------|-----------------------------|--------------|
|                                           |                             | <i>Feet.</i> |
| Furnace Creek .....                       | Wheeler .....               | 405          |
| Furnace Springs .....                     | Wheeler .....               | 337          |
| Galt Junction .....                       | C. P. R. R. ....            | 49           |
| Gavilan .....                             | U. S. C. & G. S. ....       | 2,816        |
| Do .....                                  | Whitney .....               | 3,381        |
| Georgetown .....                          | Toner .....                 | 2,433        |
| Georgetown Pass .....                     | Whitney .....               | 7,119        |
| Do .....                                  | C. P. R. R. Surveys .....   | 7,154        |
| Gilroy .....                              | Toner .....                 | 193          |
| Glenville .....                           | Wheeler .....               | 3,004        |
| Gold Run .....                            | C. P. R. R. ....            | 3,220        |
| Gold Spring Ranch .....                   | Wheeler .....               | 2,014        |
| Goodrich's Ranch .....                    | Wheeler .....               | 4,883        |
| Goose Lake .....                          | Wheeler .....               | 4,697        |
| Gordon's Ranch .....                      | Wheeler .....               | 737          |
| Gorman's Ranch .....                      | Wheeler .....               | 3,838        |
| Goshen .....                              | C. P. R. R. ....            | 278          |
| Goshen Junction, with S. P. R. R. ....    | C. P. R. R. ....            | 280          |
| Guano Island .....                        | U. S. C. & G. S. ....       | 28           |
| Granite Spring .....                      | Wheeler .....               | 1,435        |
| Granite Springs .....                     | Wheeler .....               | 4,115        |
| Granite Station .....                     | Wheeler .....               | 1,744        |
| Granite Wells .....                       | Wheeler .....               | 2,080        |
| Grape Vine Peak .....                     | Wheeler .....               | 8,528        |
| Grape Vine Ranch .....                    | Wheeler .....               | 2,247        |
| Grape Vine Spring .....                   | Wheeler .....               | 2,432        |
| Grass Lake .....                          | Wheeler .....               | 8,564        |
| Grass Valley .....                        |                             | 2,090        |
| Do .....                                  | Nev. Co. N. G. R. R. ....   | 2,454        |
| Gravel Range .....                        | Wheeler .....               | 2,987        |
| Gray's Ranch .....                        | Wheeler .....               | 307          |
| Do .....                                  | Wheeler .....               | 1,100        |
| Green Bluff .....                         | U. S. C. & G. S. ....       | 486          |
| Green Mountain .....                      | Wheeler .....               | 1,351        |
| Do .....                                  | Wheeler .....               | 1,352        |
| Green's Ranch .....                       | Wheeler .....               | 4,479        |
| Greenville .....                          | Wheeler .....               | 3,544        |
| Gridley .....                             | Toner .....                 | 97           |
| Griffith's Ranch .....                    | Wheeler .....               | 473          |
| Grizzly Giant, Mariposa Grove .....       | Wheeler .....               | 5,838        |
| Grizzly Hill .....                        | Wheeler (Theod) .....       | 5,709        |
| Grizzly Peak .....                        | Wheeler .....               | 11,723       |
| Do .....                                  | Wheeler .....               | 10,369       |
| Groveland .....                           | Wheeler .....               | 2,828        |
| Gyser's .....                             | Wheeler .....               | 5,864        |
| Haighs' .....                             | Wheeler .....               | 1,807        |
| Hale's .....                              | Wheeler .....               | 2,739        |
| Halfway house .....                       | Wheeler .....               | 3,359        |
| Halloran Spring .....                     | Wheeler .....               | 3,272        |
| Hamilton Mountain .....                   | Whitney .....               | 4,440        |
| Hamilton (near) .....                     | Pacific R. R. Reports ..... | 260          |
| Hardin's .....                            | Wheeler .....               | 3,396        |
| Harkness Mountain, near Big Meadows ..... | Wheeler (Theod) .....       | 8,875        |
| Harris' Ranch, Madeline Plains .....      | Wheeler .....               | 5,339        |
| Harris' Station, Amander Road .....       | Wheeler .....               | 5,439        |
| Hart's Ranch .....                        | Wheeler .....               | 242          |
| Haskell's Peak .....                      | Wheeler .....               | 8,128        |
| Hat Mountain .....                        | Wheeler .....               | 7,676        |
| Haughtown Crossing .....                  | S. & P. R. R. ....          | 85           |
| Havilah Town .....                        | Wheeler .....               | 3,150        |
| Hays' Station .....                       | Wheeler .....               | 5,967        |
| Hasel Green .....                         | Wheeler .....               | 5,550        |
| Haselton Peak .....                       | Wheeler .....               | 2,960        |

| Station.                       | Authority.                  | Elevat   |
|--------------------------------|-----------------------------|----------|
| Hazel Valley .....             | Wheeler .....               | <i>F</i> |
| Helena, Mount .....            | Whitney .....               | 3,       |
| Hennes Pass .....              | C. P. R. R. Surveys .....   | 4,       |
| Do .....                       | Whitney .....               | 7,       |
| Hennessy's Bridge .....        | Wheeler .....               | 6,       |
| Henry, Mount .....             | Whitney .....               | 1,       |
| Hermit Valley .....            | Wheeler .....               | 2,       |
| Hickman's Ranch .....          | Wheeler .....               | 7,       |
| High Bluff .....               | U. S. C. & G. S. .....      | 1,       |
| High Hill .....                | U. S. C. & G. S. .....      |          |
| Highland Peak .....            | Wheeler .....               | 10,      |
| Hill's Ranch .....             | Pacific R. R. Reports ..... | 4,       |
| Hite's Cove .....              | Wheeler .....               | 1,       |
| Hodgdon's .....                | Wheeler .....               | 4,       |
| Hoffmann Peak .....            | Wheeler .....               | 10,      |
| Hogle .....                    | C. P. R. R. .....           |          |
| Hollister .....                | Toner .....                 |          |
| Homestead .....                | S. & P. R. R. .....         |          |
| Honey Lake .....               | Wheeler .....               | 3,       |
| Hooker .....                   |                             |          |
| Hope Valley .....              | Williamson .....            | 7,       |
| Hornitos Hotel .....           | Wheeler .....               |          |
| Horn Spring .....              | Wheeler .....               | 5,       |
| Horsley's Station .....        | Wheeler .....               | 3,       |
| Hosselkus' Ranch .....         | Wheeler .....               | 3,       |
| Hotchkies Ranch .....          | Wheeler .....               | 2,       |
| Hot Springs .....              | Wheeler .....               | 6,       |
| Do .....                       | Wheeler .....               | 7,       |
| Do .....                       | Wheeler .....               | 7,       |
| Hough's Mountain .....         | Wheeler (Theod) .....       | 7,       |
| Hovely's Camp .....            | Wheeler .....               | 3,       |
| Hubertville .....              | Toner .....                 |          |
| Hughes' Ranch .....            | Wheeler .....               | 3,       |
| Humboldt, Fort .....           | Med. Dept., U. S. A. .....  |          |
| Humburg Park .....             | Wheeler .....               | 4,       |
| Humpahyamp Pass .....          | P. R. R. Reports .....      | 5,       |
| Hunter's Ranch .....           | Wheeler .....               | 6,       |
| Do .....                       | Wheeler .....               | 6,       |
| Huntington, Mohave River ..... | Wheeler .....               | 2,       |
| Hupps' Mill .....              | Wheeler .....               | 2,       |
| Hyde's Union Saw-Mill .....    | Wheeler .....               | 5,       |
| Illinois Ranch .....           | Wheeler .....               | 1,       |
| Illinoistown .....             | Toner .....                 | 2,       |
| Independence, Camp .....       | Wheeler .....               | 3,       |
| Do .....                       | Smithsonian Inst .....      | 4,       |
| Indian Gulch .....             | Wheeler .....               |          |
| Indian Valley .....            | Toner .....                 | 3,       |
| Indian Wells .....             | C. P. R. R. .....           |          |
| Do .....                       | Wheeler .....               | 2,       |
| Ingalls, Mount .....           | Wheeler .....               | 8,       |
| Inskip Toll-gate .....         | Wheeler .....               | 4,       |
| Ione .....                     | C. P. R. R. .....           |          |
| Ivanpah .....                  | Wheeler .....               | 4,       |
| Jackson .....                  | Toner .....                 |          |
| Jacksonville .....             | Wheeler .....               |          |
| Jelly's Ranch .....            | Wheeler .....               |          |
| Joe's Peak .....               | Wheeler .....               | 9        |
| John's, Mount .....            | Petermann .....             | 8        |
| Johnson's Pass .....           | Goddard .....               | 6        |
| Do .....                       | C. P. R. R. Surveys .....   | 7        |
| Do .....                       | Simpson .....               | 7        |
| Do .....                       | Whitney .....               | 7        |

| Station.                                                                   | Authority.                  | Elevation.   |
|----------------------------------------------------------------------------|-----------------------------|--------------|
|                                                                            |                             | <i>Feet.</i> |
| Johnson's Ranch .....                                                      | Wheeler .....               | 3,460        |
| Johnson's Ranch, Bresser Creek .....                                       | Wheeler .....               | 5,643        |
| Jones, Fort .....                                                          | Med. Dep., U. S. A .....    | 2,570        |
| Jones' Mill, near Dutch Flat .....                                         | .....                       | 3,416        |
| Junction House .....                                                       | Wheeler .....               | 3,562        |
| Junction House, on Reno and Susanville<br>road, near Beckwith's Pass ..... | Wheeler .....               | 4,639        |
| Junction with Oregon Branch .....                                          | C. P. R. R .....            | 163          |
| Kaweah Peak .....                                                          | Whitney .....               | 14,000       |
| Keg Spring, Willow Creek .....                                             | Wheeler .....               | 5,757        |
| Kern Lake .....                                                            | Pacific R. R. Reports ..... | 398          |
| Kernville .....                                                            | Wheeler .....               | 2,551        |
| Kettle Rock Peak .....                                                     | Wheeler .....               | 7,843        |
| Keystone House .....                                                       | Wheeler .....               | 1,093        |
| Keyville .....                                                             | .....                       | 2,558        |
| Kincaid's Flat .....                                                       | Wheeler .....               | 1,589        |
| Kincaid's Ranch .....                                                      | Wheeler .....               | 1,771        |
| King's Springs, Death Valley .....                                         | Wheeler .....               | —225         |
| Kingston .....                                                             | Petermann .....             | 1,118        |
| Kirkwood's .....                                                           | Wheeler .....               | 7,677        |
| Knight's Ferry Bridge .....                                                | Wheeler .....               | 180          |
| Knight's Landing .....                                                     | C. P. R. R .....            | 43           |
| Kress .....                                                                | Nov. Co. N. G. R. R .....   | 2,857        |
| La Bayonne .....                                                           | Wheeler .....               | 16           |
| Lagrange .....                                                             | Wheeler .....               | 222          |
| Lake City .....                                                            | Wheeler .....               | 4,624        |
| Lake City Pass .....                                                       | Wheeler .....               | 7,035        |
| Lakeview .....                                                             | Wheeler .....               | 4,851        |
| La Laguna Ranch .....                                                      | Wheeler .....               | 129          |
| Lambert's Soda Spring .....                                                | Wheeler .....               | 8,558        |
| La Motte's .....                                                           | Wheeler .....               | 6,491        |
| Lane's Crossing, Mojave River .....                                        | Wheeler .....               | 2,819        |
| Lankershin's Ranch .....                                                   | Wheeler .....               | 563          |
| Lassen's Butte .....                                                       | Wheeler .....               | 10,437       |
| Do .....                                                                   | Whitney .....               | 10,577       |
| Lathrop Junction, with Visalia Division ..                                 | C. P. R. R .....            | 26           |
| Latrobe .....                                                              | S. P. R. R .....            | 782          |
| Lava Bed Station .....                                                     | Wheeler .....               | 446          |
| Lawrence .....                                                             | Toner .....                 | 66           |
| Leach's Point .....                                                        | Wheeler .....               | 3,409        |
| Leek Spring .....                                                          | Wheeler .....               | 7,242        |
| Lewis' Ranch .....                                                         | Wheeler .....               | 966          |
| Lewis' Ranch, near Loyalton .....                                          | Wheeler .....               | 4,949        |
| Lievre Ranch .....                                                         | Wheeler .....               | 3,756        |
| Lillie's Ranch .....                                                       | Wheeler .....               | 3,647        |
| Lime Point Bluff .....                                                     | U. S. C. & G. S .....       | 495          |
| Lincoln .....                                                              | C. P. R. R .....            | 161          |
| Lion's Head .....                                                          | Wheeler .....               | 1,693        |
| Little Yosemite .....                                                      | Wheeler .....               | 6,442        |
| Livermore .....                                                            | C. P. R. R .....            | 485          |
| Livermore Pass .....                                                       | Whitney .....               | 686          |
| Liverpool Landing, Colorado River .....                                    | Wheeler .....               | 606          |
| Lobos Point .....                                                          | U. S. C. & G. S .....       | 326          |
| Do .....                                                                   | U. S. C. & G. S .....       | 378          |
| Lodi .....                                                                 | C. P. R. R .....            | 55           |
| Lomo .....                                                                 | Wheeler .....               | 3,848        |
| Lone Pine .....                                                            | Wheeler .....               | 3,810        |
| Longville .....                                                            | Wheeler (Theod.) .....      | 4,309        |
| Lookout Hill .....                                                         | Wheeler .....               | 4,214        |
| Lookout Mountain .....                                                     | Wheeler .....               | 9,670        |
| Loomis' Ranch .....                                                        | Wheeler .....               | 4,357        |
| Lopez Ranch .....                                                          | Wheeler .....               | 3,248        |
| Los Angeles .....                                                          | C. P. R. R .....            | 265          |

| Station.                    | Authority.                 | Elevation.   |
|-----------------------------|----------------------------|--------------|
|                             |                            | <i>Feet.</i> |
| Los Angeles.....            | Wheeler.....               | 326          |
| Do.....                     | Pacific R. R. Reports..... | 250          |
| Do.....San Pedro Dessa..... | L. A. & I. R. R.....       | 260          |
| Do.....Signal Station.....  | U. S. Signal Office.....   | 350          |
| Los Encinos Ranch.....      | Wheeler.....               | 772          |
| Los Pozos Ranch.....        | Wheeler.....               | 259          |
| Los Toros.....              | Wheeler.....               | 203          |
| Lott's Diggins.....         | Wheeler.....               | 6,310        |
| Luther's Pass.....          | Goddard.....               | 7,185        |
| Do.....                     | Simpson.....               | 7,505        |
| Lyell, Mt.....              | Wheeler.....               | 13,190       |
| Do.....                     | Whitney.....               | 13,217       |
| Lyons's Ranch.....          | Wheeler.....               | 1,397        |
| McBride's.....              | Wheeler.....               | 5,561        |
| McBride's Peak.....         | Wheeler.....               | 13,441       |
| McConnahas'.....            | Wheeler.....               | 3,981        |
| McCumber's Mill.....        | Pacific R. R. Reports..... | 3,491        |
| McDonald Peak.....          | Wheeler.....               | 7,954        |
| McDonald Ranch.....         | Wheeler.....               | 5,297        |
| McGill, Mt.....             | Wheeler (Theod.).....      | 9,214        |
| McKesick's Peak.....        | Wheeler.....               | 7,083        |
| McKesick's Ranch.....       | Wheeler.....               | 4,469        |
| McQuade's.....              | Wheeler.....               | 1,888        |
| Macon.....                  | Toner.....                 | 450          |
| Madeline Hat Peak.....      | Wheeler.....               | 7,676        |
| Madeline Pass.....          | P. R. R. Reports.....      | 5,667        |
| Malaga.....                 | Wheeler.....               | 2,320        |
| Mapes.....                  | Wheeler.....               | 5,039        |
| Mare Island, N. E.....      | U. S. C. & G. S.....       | 283          |
| Mare Island, N. W.....      | U. S. C. & G. S.....       | 101          |
| Mare Island.....            | U. S. C. & G. S.....       | 29           |
| Marin Island.....           | U. S. C. & G. S.....       | 74           |
| Marion.....                 | U. S. C. & G. S.....       | 74           |
| Mariposa.....               | Wheeler.....               | 1,992        |
| Do...Town Hall.....         | Wheeler.....               | 1,971        |
| Do...post-office.....       | Wheeler.....               | 1,942        |
| Mariposa Peak.....          | Whitney.....               | 3,700        |
| Markleeville.....           | Wheeler.....               | 5,525        |
| Marlett's Lake.....         | Wheeler.....               | 7,750        |
| Marlett's Peak.....         | Wheeler.....               | 8,631        |
| Marlett's Ranch.....        | Wheeler.....               | 8,074        |
| Marl Spring.....            | Pacific R. R. Reports..... | 3,793        |
| Martinez East.....          | U. S. C. & G. S.....       | 187          |
| Martinez C. H.....          | U. S. C. & G. S.....       | 27           |
| Martin's.....               | Monterey R. R.....         | 16           |
| Do.....                     | Monterey R. R.....         | 1,992        |
| Martin's Ranch.....         | Wheeler.....               | 2,055        |
| Marysville.....             | C. P. R. R.....            | 67           |
| Do.....                     | Smithsonian Inst.....      | 80           |
| Master's Hill.....          | U. S. C. & G. S.....       | 2,445        |
| Matthews' Ranch.....        | Wheeler.....               | 6,294        |
| Maturango, Mt.....          | Wheeler (Theod.).....      | 8,844        |
| Mayfield.....               | Toner.....                 | 34           |
| Mayhews.....                | S. & P. R. R.....          | 58           |
| Meade, Mt.....              | Wheeler.....               | 10,540       |
| Meadow Mountain.....        | Wheeler.....               | 11,734       |
| Meadow Valley.....          | Wheeler.....               | 3,757        |
| Melrose.....                | C. P. R. R.....            | 18           |
| Menatchey Valley.....       | Wheeler.....               | 9,503        |
| Merced.....                 | C. P. R. R.....            | 173          |
| Merced Falls.....           | Wheeler.....               | 360          |
| Meroed, Mt.....             | Wheeler.....               | 11,413       |

| Station.                                 | Authority.                  | Elevation.   |
|------------------------------------------|-----------------------------|--------------|
|                                          |                             | <i>Feet.</i> |
| Merritt's .....                          | C. P. R. R. ....            | 54           |
| Mesquite Spring .....                    | Wheeler .....               | 2,010        |
| Mesquite Wells .....                     | .....                       | 3,674        |
| Middle Lake, Surprise Valley .....       | Wheeler .....               | 4,551        |
| Midway .....                             | C. P. R. R. ....            | 356          |
| Mill Creek, Sonora road .....            | Wheeler .....               | 7,076        |
| Miller, Fort .....                       | Med. Dept., U. S. A. ....   | 402          |
| Miller's Ranch .....                     | Wheeler .....               | 4,055        |
| Mills of Madera Flume & Trading Co. .... | Wheeler .....               | 4,499        |
| Milton .....                             | Wheeler .....               | 376          |
| Do .....                                 | Wheeler .....               | 5,845        |
| Mineral Bar .....                        | Toner .....                 | 1,121        |
| Mitchell's Ranch .....                   | Wheeler .....               | 4,285        |
| Moccasin, Mt. ....                       | Wheeler .....               | 2,791        |
| Modesto .....                            | C. P. R. R. ....            | 93           |
| Mojave .....                             | C. P. R. R. ....            | 2,751        |
| Mokelumne .....                          | Toner .....                 | 5,523        |
| Mokelumne, Mt. ....                      | Wheeler .....               | 9,467        |
| Molate Island .....                      | U. S. C. & G. S. ....       | 169          |
| Molate Point .....                       | U. S. C. & G. S. ....       | 133          |
| Mono Lake .....                          | U. S. Geol. Survey .....    | 6,730        |
| Mono Pass .....                          | Whitney .....               | 10,765       |
| Monte .....                              | Toner .....                 | 354          |
| Monte Diablo .....                       | Whitney .....               | 3,856        |
| Monterey .....                           | Monterey R. R. ....         | 7            |
| Do .....                                 | Med. Dept., U. S. A. ....   | 140          |
| Moonlight Valley .....                   | Wheeler .....               | 5,433        |
| Moquelumne Hill .....                    | Smithsonian Inst. ....      | 1,502        |
| Moran's Ranch .....                      | Wheeler .....               | 3,964        |
| Mormon Bar .....                         | Wheeler .....               | 1,630        |
| Morocojo .....                           | Monterey R. R. ....         | 15           |
| Morongo Basin .....                      | Toner .....                 | 1,500        |
| Morrow, Mt. ....                         | Wheeler .....               | 2,065        |
| Mosquito Spring .....                    | Wheeler .....               | 2,010        |
| Mountain House .....                     | Wheeler .....               | 5,641        |
| Mud Spring, Amandor road .....           | Wheeler .....               | 5,973        |
| Mud Springs .....                        | Wheeler .....               | 4,671        |
| Murphy .....                             | U. S. C. & G. S. ....       | 2,703        |
| Murphy's Cabin, Lake Tenaiya .....       | Wheeler .....               | 7,971        |
| Murphy's Mining Village .....            | Wheeler .....               | 2,195        |
| Murphy's Ranch, Buffalo Salt Works ..... | Wheeler .....               | 3,845        |
| Myers' Ferry .....                       | Wheeler .....               | 7,434        |
| Myers' Station .....                     | Wheeler .....               | 3,759        |
| Nadean's Station .....                   | Wheeler .....               | 2,394        |
| Napa .....                               | C. P. R. R. ....            | 18           |
| Napa Junction .....                      | C. P. R. R. ....            | 8            |
| Napa Junction (Adalante) .....           | C. P. R. R. ....            | 76           |
| Nash's Ranch .....                       | Wheeler .....               | 4,431        |
| Nelson .....                             | Toner .....                 | 125          |
| Nevada City .....                        | Nev. Co. N. G. R. R. ....   | 2,531        |
| Newbury Peak .....                       | Wheeler .....               | 3,375        |
| Newbury Park .....                       | Wheeler .....               | 830          |
| Newcastle .....                          | C. P. R. R. ....            | 956          |
| Newhall .....                            | C. P. R. R. ....            | 1,152        |
| Newhall's Ranch .....                    | Wheeler .....               | 974          |
| New Pass .....                           | P. R. R. Reports .....      | 3,164        |
| New York Tent .....                      | Wheeler .....               | 1,143        |
| Niagara Creek, Sonora road .....         | Wheeler .....               | 6,690        |
| Nicholas (near) .....                    | Pacific R. R. Reports ..... | 289          |
| Nichols Point .....                      | Wheeler .....               | 6,262        |
| Niles Junc. with San José Branch .....   | C. P. R. R. ....            | 88           |
| Nimahew .....                            | Wheeler .....               | 2,451        |
| Noble's Pass .....                       | Wheeler .....               | 5,963        |



| Station.                                 | Authority.                | Eleva |
|------------------------------------------|---------------------------|-------|
| Noble's Pass .....                       | Williamson .....          |       |
| Noman's Spring .....                     | Wheeler .....             |       |
| Nora .....                               | C. P. R. R. ....          |       |
| Nordhoff .....                           | Wheeler .....             |       |
| North Dome (above valley 3,633) .....    | Wheeler .....             |       |
| North End Peak .....                     | Wheeler .....             |       |
| Northups (Excelsior Hotel) .....         | U. S. C. & G. S. ....     |       |
| Norwalk .....                            | C. P. R. R. ....          |       |
| Nott's Ranch .....                       | Wheeler .....             |       |
| Null's Ranch .....                       | Wheeler .....             |       |
| Oakdale .....                            | Wheeler .....             |       |
| Oak Knoll .....                          | C. P. R. R. ....          |       |
| Oakland .....                            | C. P. R. R. ....          |       |
| Oakland Wharf .....                      | C. P. R. R. ....          |       |
| Observation Peak .....                   | Wheeler .....             |       |
| Ogburn's Ranch .....                     | Wheeler (Theod.) .....    |       |
| Olancho Peak .....                       | Wheeler .....             | 1     |
| Old Bony Mountain .....                  | Wheeler .....             |       |
| Old Kimschow Settlement .....            | Wheeler .....             |       |
| Omjumi, Mountain .....                   | Whitney .....             |       |
| Do .....                                 | Wheeler .....             |       |
| Orange .....                             | C. P. R. R. ....          |       |
| Oroville .....                           | Wheeler .....             |       |
| Oso Meadows .....                        | Wheeler .....             |       |
| Oso Mountain .....                       | Whitney .....             |       |
| Owen's River Bridge .....                | Wheeler .....             |       |
| Pacheco .....                            | U. S. C. & G. S. ....     |       |
| Pacheco Pass .....                       | Whitney .....             |       |
| Pacheco's Peak .....                     | Whitney .....             |       |
| Pacific House .....                      | Wheeler .....             |       |
| Pah Ute Mines .....                      | Wheeler .....             |       |
| Pah Ute Peak .....                       | Wheeler .....             |       |
| Pah Ute Springs .....                    | Wheeler .....             |       |
| Pajaro .....                             | Toner .....               |       |
| Palota Peak .....                        | Wheeler .....             |       |
| Palmer's Ranch .....                     | Wheeler .....             |       |
| Pampa .....                              | Wheeler .....             |       |
| Panamint .....                           | Wheeler .....             |       |
| Panamint Station .....                   | Wheeler .....             |       |
| Panoche Pass .....                       | Whitney .....             |       |
| Panola .....                             | Toner .....               |       |
| Paradise .....                           | Toner .....               |       |
| Paris .....                              | C. P. R. R. ....          |       |
| Park .....                               | L. A. & I. R. R. ....     |       |
| Parker's Ranch .....                     | Wheeler .....             |       |
| Parrott's (formerly Pandola) Ferry ..... | Wheeler .....             |       |
| Peach Spring .....                       | Wheeler .....             |       |
| Peddler's Hill .....                     | Wheeler .....             |       |
| Peña Blanca (Haigh's Ranch) .....        | Wheeler .....             |       |
| Peninsula Hill .....                     | U. S. C. & G. S. ....     |       |
| Penolo, Point .....                      | U. S. C. & G. S. ....     |       |
| Penryn .....                             | Toner .....               |       |
| Perkins .....                            | S. P. R. R. ....          |       |
| Petalume Creek .....                     | U. S. C. & G. S. ....     |       |
| Phillips Ranch .....                     | Wheeler .....             |       |
| Phillips Ranch .....                     | Wheeler .....             |       |
| Phillips Station .....                   | Wheeler .....             |       |
| Pilot Knob .....                         | Wheeler .....             |       |
| Pilot Peak .....                         | Whitney .....             |       |
| Pinos Mountain .....                     | Petermann .....           |       |
| Pinto Rock .....                         | Wheeler .....             |       |
| Piute Pass .....                         | K. P. R. R. surveys ..... |       |
| Placerville .....                        | Toner .....               |       |

| Station.                          | Authority.                 | Elevation.   |
|-----------------------------------|----------------------------|--------------|
|                                   |                            | <i>Feet.</i> |
| Placerville.....                  | Williamson.....            | 1,965        |
| Placerville Post-office.....      | Wheeler.....               | 1,893        |
| Plainsburgh.....                  | Toner.....                 | 209          |
| Pleasanton.....                   | C. P. R. R.....            | 353          |
| Pleasant Valley.....              | Wheeler.....               | 2,405        |
| Point of Rocks.....               | Wheeler.....               | 2,542        |
| Porcupine Flat.....               | Wheeler.....               | 7,749        |
| Potraro.....                      | Wheeler.....               | 1,028        |
| Prattville.....                   | Wheeler.....               | 4,394        |
| Priest's Hotel.....               | Wheeler.....               | 2,558        |
| Princeton.....                    | Wheeler.....               | 2,104        |
| Probasco's Ranch.....             | Wheeler.....               | 973          |
| Pulgas Base, East End.....        | U. S. C. & G. S.....       | 19           |
| Pulgas Base, West End.....        | U. S. C. & G. S.....       | 129          |
| Pyramid Mountain.....             | Wheeler.....               | 10,127       |
| Quincy.....                       | Wheeler.....               | 3,381        |
| Quinalmango.....                  | Toner.....                 | 1,064        |
| Railroad Flat.....                | Wheeler.....               | 2,606        |
| Rancho del Chino y de Jurupa..... | Med. Dept. U. S. A.....    | 1,000        |
| Ravenna.....                      | C. P. R. R.....            | 2,347        |
| Rawhide Camp.....                 | Wheeler.....               | 1,556        |
| Rawson.....                       | Wheeler.....               | 228          |
| Read.....                         | U. S. C. & G. S.....       | 474          |
| Reading, Fort.....                | Pacific R. R. Reports..... | 596          |
| Do.....                           | Pacific R. R. Reports..... | 675          |
| Do.....                           | Pacific R. R. Reports..... | 674          |
| Do.....                           | Med. Dept. U. S. A.....    | 518          |
| Red Bluff.....                    | Wheeler.....               | 307          |
| Do.....                           | Williamson.....            | 370          |
| Do.....                           | C. P. R. R.....            | 308          |
| Do..... Signal Station.....       | U. S. Sig. Office.....     | 324          |
| Redding.....                      | C. P. R. R.....            | 556          |
| Red Hill Station.....             | U. S. C. & G. S.....       | 188          |
| Redmans Ranch.....                | Wheeler.....               | 1,181        |
| Red Rock Station.....             | Wheeler.....               | 2,394        |
| Red Slate Peak.....               | Whitney.....               | 13,400       |
| Redwood City.....                 | Toner.....                 | 10           |
| Reilly's Station.....             | Wheeler.....               | 1,477        |
| Reservoir House.....              | Wheeler.....               | 1,013        |
| Reservoir, in Concord Valley..... | Wheeler.....               | 202          |
| Reynolds' Ferry.....              | Wheeler.....               | 543          |
| Rhett Lake.....                   | P. R. R. Reports.....      | 4,014        |
| Richardson.....                   | U. S. C. & G. S.....       | 1,116        |
| Richmond Point.....               | U. S. C. & G. S.....       | 192          |
| Rincon.....                       | Toner.....                 | 2,050        |
| Ripley Mountain.....              | Petermann.....             | 7,500        |
| Ritgers' Ranch.....               | Wheeler.....               | 4,345        |
| Roberts' Ferry.....               | Wheeler.....               | 184          |
| Robertson's.....                  | Wheeler.....               | 819          |
| Roble.....                        | Toner.....                 | 179          |
| Rocklin.....                      | C. P. R. R.....            | 249          |
| Rock Spring.....                  | Pacific R. R. Reports..... | 4,896        |
| Rocky Island.....                 | U. S. C. & G. S.....       | 157          |
| Rock's Ranch.....                 | P. R. R. Reports.....      | 4,181        |
| Rose Springs.....                 | Wheeler.....               | 3,545        |
| Ross Mountain.....                | U. S. C. & G. S.....       | 2,205        |
| Routiers.....                     | S. P. R. R.....            | 72           |
| Rowland's Ranch.....              | Wheeler.....               | 6,222        |
| Rutherford.....                   | C. P. R. R.....            | 168          |
| Sackett's Wells.....              | Toner.....                 | 312          |
| Sacramento.....                   | C. P. R. R.....            | 30           |
| Do.....                           | Smithsonian Inst.....      | 82           |
| Do.....                           | Williamson.....            | 81           |

(173)

| Station.                              | Authority.                 | Elevation.       |
|---------------------------------------|----------------------------|------------------|
|                                       |                            | <i>Fect.</i>     |
| Sacramento Signal Station.....        | U. S. Signal Office.....   | 70               |
| Saddle (Malaga) Mountain.....         | Wheeler.....               | 2, 896           |
| Saint Clair Ranch.....                | Wheeler.....               | 1, 961           |
| Saint Helena.....                     | C. P. R. R.....            | 244              |
| Salinas City.....                     | .....                      | 42               |
| Salisbury.....                        | S. P. R. R.....            | 126              |
| Salt Wells.....                       | Wheeler.....               | 117              |
| San Andreas.....                      | Wheeler.....               | 1, 033           |
| San Antonio Peak.....                 | U. S. C. & G. S.....       | 9, 931           |
| Do.....                               | Wheeler.....               | 10, 191          |
| San Benito.....                       | Smithsonian Inst.....      | 140              |
| San Benito Pass.....                  | K. P. R. R. Surveys.....   | 2, 700           |
| San Bernardino.....                   | Wheeler.....               | 950              |
| San Bernardino Mountain.....          | Whitney.....               | 11, 600          |
| San Bernardo.....                     | Pacific R. R. Reports..... | 1, 118           |
| San Bruno.....                        | Toner.....                 | 16               |
| San Buenaventura.....                 | Toner.....                 | 12               |
| San Carlos Peak.....                  | Whitney.....               | 4, 977           |
| Sand Creek.....                       | C. P. R. R.....            | 2, 315           |
| Sand Knoll.....                       | U. S. C. & G. S.....       | 227              |
| San Diego.....                        | Emory.....                 | 30               |
| Do... Mission.....                    | Pacific R. R. Reports..... | 64               |
| Do... Signal Station.....             | U. S. Signal Office.....   | 67               |
| San Emigdio Store.....                | Wheeler.....               | 788              |
| San Fernando.....                     | C. P. R. R.....            | 1, 066           |
| Do.....                               | Wheeler.....               | 1, 034           |
| San Fernando Pass.....                | Pacific R. R. Reports..... | 1, 940           |
| San Fernando Peak.....                | Wheeler.....               | 3, 793           |
| San Fernando Tunnel, south mouth..... | Wheeler.....               | 1, 429           |
| San Felipe.....                       | Pacific R. R. Reports..... | 2, 176           |
| Do.....                               | Pacific R. R. Reports..... | 2, 456           |
| San Francisco, Signal Station.....    | U. S. Signal Office.....   | 60               |
| Do..... Presidio.....                 | Med. Dept. U. S. A.....    | 150              |
| Do.....                               | U. S. C. & G. S.....       | 384              |
| San Francisquito Cañon.....           | Wheeler.....               | 2, 382           |
| San Francisquito Pass.....            | P. R. R. Reports.....      | 3, 718           |
| San Gabriel.....                      | Wheeler.....               | 419              |
| Do..... Church.....                   | Wheeler.....               | 481              |
| San Gabriel Mine.....                 | Wheeler.....               | 1, 703           |
| San Gabriel Peak.....                 | .....                      | 6, 232           |
| San Gabriel Range.....                | Whitney.....               | 4, 500 to 6, 500 |
| San Gorgonio.....                     | C. P. R. R.....            | 2, 560           |
| San Gorgonio Pass.....                | P. R. R. Reports.....      | 2, 800           |
| Do.....                               | T. & P. R. R.....          | 2, 621           |
| San Isabel Rancho.....                | Toner.....                 | 2, 957           |
| San Jacinto Mountain.....             | Wheeler.....               | 10, 987          |
| San Jose.....                         | C. P. R. R.....            | 91               |
| Do.....                               | U. S. C. & G. S.....       | 118              |
| San Leandro.....                      | C. P. R. R.....            | 48               |
| San Lorenzo.....                      | Toner.....                 | 35               |
| San Luis Obispo.....                  | Toner.....                 | 402              |
| San Luis Pass.....                    | P. R. R. Reports.....      | 1, 556           |
| San Luis Rey.....                     | Med. Dept. U. S. A.....    | 20               |
| San Mateo.....                        | Toner.....                 | 23               |
| San Miguel.....                       | Toner.....                 | 616              |
| San Pablo Point.....                  | U. S. C. & G. S.....       | 97               |
| San Pascual.....                      | Emory.....                 | 716              |
| San Pedro.....                        | Pacific R. R. Reports..... | 30               |
| San Pedro Point.....                  | U. S. C. & G. S.....       | 356              |
| San Pedro Hill.....                   | Wheeler.....               | 1, 462           |
| San Quentin, Point.....               | U. S. C. & G. S.....       | 173              |
| Santa Ana.....                        | U. S. C. & G. S.....       | 3, 620           |
| Do.....                               | C. P. R. R.....            | 137              |
| Santa Ana Hotel.....                  | Wheeler.....               | 141              |

| Station.                                   | Authority.                 | Elevation.   |
|--------------------------------------------|----------------------------|--------------|
|                                            |                            | <i>Feet.</i> |
| Santa Barbara.....                         | Smithsonian Inst.....      | 20           |
| Santa Buena Ventura.....                   | Wheeler.....               | 146          |
| Santa Catalene.....                        | Toner.....                 | 3,000        |
| Santa Clara.....                           | Smithsonian Inst.....      | 98           |
| Santa Cruz Station.....                    | U. S. C. & G. S.....       | 359          |
| Santa Cruz Point.....                      | U. S. C. & G. S.....       | 32           |
| Santa Isabella.....                        |                            | 3,050        |
| Santa Isabella Rancho.....                 | Pacific R. R. Reports..... | 2,957        |
| Santa Monica.....                          | L. A. & I. R. R.....       | 20           |
| Do.....                                    | Wheeler.....               | 15           |
| Santa Paula.....                           | Wheeler.....               | 384          |
| Santa Rosa Valley.....                     | Wheeler.....               | 175          |
| San Vincente.....                          | L. A. & I. R. R.....       | 167          |
| Say-qui-to Spring.....                     | Wheeler.....               | 5,553        |
| Schaffers, Mount.....                      | Wheeler.....               | 6,864        |
| School House.....                          | S. P. R. R.....            | 100          |
| Schultz, Mount.....                        | Wheeler.....               | 2,275        |
| Scodie's Ranch.....                        | Wheeler.....               | 2,716        |
| Semi Pass.....                             | P. R. R. Reports.....      | 1,577        |
| Sentinel Dome (above valley 4,160).....    | Wheeler.....               | 8,011        |
| Seema.....                                 | Toner.....                 | 229          |
| Sevastapol Flat.....                       | Wheeler.....               | 2,210        |
| Seven Palms.....                           | C. P. R. R.....            | 1,126        |
| Shafer's Station.....                      | Wheeler.....               | 4,026        |
| Shasta.....                                |                            | 1,160        |
| Shasta, Mount.....                         | Whitney.....               | 14,442       |
| Shasta, Mount (timber line on).....        |                            | 8,000        |
| Shaw's Flat.....                           | Toner.....                 | 2,270        |
| Do.....                                    | Wheeler.....               | 2,036        |
| Shaw's Ranch.....                          | Wheeler.....               | 6,311        |
| Shear's Bridge.....                        | Wheeler.....               | 2,007        |
| Sheep Head.....                            | Wheeler.....               | 3,914        |
| Sheffer's Hot Springs.....                 | Wheeler.....               | 4,094        |
| Sheridan.....                              |                            | 113          |
| Shingle Springs.....                       | S. P. R. R.....            | 1,427        |
| Shinn's Ranch.....                         | Wheeler.....               | 5,040        |
| Shoo-fly Bridge.....                       | Wheeler.....               | 3,071        |
| Shumway's Ranch.....                       | Wheeler.....               | 5,067        |
| Sierra Valley.....                         | Wheeler.....               | 4,910        |
| Sierraville, Junc. of S. T. & L. Road..... | Wheeler.....               | 4,904        |
| Do..... Post-office.....                   | Wheeler.....               | 4,880        |
| Silliman, Mt.....                          | Whitney.....               | 11,623       |
| Silver Creek.....                          | Toner.....                 | 3,700        |
| Silver Lake Hotel.....                     | Wheeler.....               | 7,174        |
| Silver Mt.....                             | Whitney.....               | 10,934       |
| Silver Mountain City.....                  | Wheeler.....               | 6,446        |
| Silver Mountain Pass.....                  | Whitney.....               | 8,793        |
| Simi Ranch.....                            | Wheeler.....               | 674          |
| Smith's Ranch.....                         | Wheeler.....               | 1,047        |
| Smoke Creek Depot.....                     | Wheeler.....               | 4,163        |
| Snelling Post-office.....                  | Wheeler.....               | 252          |
| Snider's Store.....                        | Wheeler.....               | 4,925        |
| Snow's Hotel.....                          | Wheeler.....               | 5,217        |
| Soap Spring.....                           | Wheeler.....               | 706          |
| Soda Lake.....                             | Pacific R. R. Reports..... | 1,002        |
| Do.....                                    | Wheeler.....               | 1,128        |
| Soledad City.....                          | Wheeler.....               | 2,513        |
| Soledad Pass.....                          | A. & P. R. R. surveys..... | 3,215        |
| Solfatara.....                             | Wheeler.....               | 5,908        |
| Sonoma Mountain.....                       | U. S. C. & G. S.....       | 2,292        |
| Sonoma Mountain.....                       | Wheeler.....               | 11,478       |
| Sonora Pass.....                           | P. R. R. Reports.....      | 10,115       |
| Sonora post-office.....                    | Wheeler.....               | 1,816        |
| Soto.....                                  | Toner.....                 | 186          |

| Station.                                           | Authority.               | Elevation.   |
|----------------------------------------------------|--------------------------|--------------|
|                                                    |                          | <i>Feet.</i> |
| South Dome (lip) (above valley 4,953).....         | Wheeler.....             | 8,804        |
| South Fork Mountain .....                          | Wheeler.....             | 7,408        |
| Spadra.....                                        | C. P. R. R.....          | 705          |
| Do.....                                            | Wheeler.....             | 802          |
| Spanish Ranch .....                                | Wheeler.....             | 3,636        |
| Sprague's Ranch .....                              | Wheeler.....             | 2,950        |
| Springville.....                                   | Wheeler.....             | 48           |
| Stanford Mountain .....                            | Whitney.....             | 9,175        |
| Starr King, Mt. (above valley 5,171) .....         | Wheeler.....             | 9,022        |
| State Line Peak.....                               | Wheeler.....             | 8,405        |
| Stevens Bar Ferry.....                             | Wheeler.....             | 614          |
| Stevens Mountain.....                              | Wheeler.....             | 10,011       |
| Stevens Ranch, Hope Valley.....                    | Wheeler.....             | 7,382        |
| Stockton, Junc. with S. & V. & S. & C. R. R's..... | C. P. R. R.....          | 23           |
| Stockton's Cabin .....                             | Wheeler.....             | 5,877        |
| Stockton Mill .....                                | Wheeler.....             | 4,639        |
| Stokes Mountain.....                               | Wheeler.....             | 2,069        |
| Stonebreakers.....                                 | Wheeler.....             | 4,380        |
| Stony Point .....                                  |                          | 500          |
| Storms.....                                        | Nev. Co. N. G. R. R..... | 2,424        |
| Strawberry .....                                   | Wheeler.....             | 5,238        |
| Strawberry Station (toll-house).....               | Wheeler.....             | 5,695        |
| Strawberry Valley .....                            | Toner.....               | 3,567        |
| Do.....                                            | Williamson.....          | 5,707        |
| Sugar Loaf Mountain.....                           | Wheeler.....             | 8,416        |
| Sulphur Peak .....                                 | U. S. C. & G. S.....     | 3,471        |
| Sulphur Spring Ranch.....                          | Wheeler.....             | 4,466        |
| Summit Peak .....                                  | Wheeler.....             | 8,301        |
| Summit Post-office, west of Beckwith's Pass.....   | Wheeler.....             | 4,875        |
| Summit Station.....                                | Wheeler.....             | 6,963        |
| Summit Valley.....                                 | Toner.....               | 6,765        |
| Sumner.....                                        | C. P. R. R.....          | 415          |
| Sunday Peak.....                                   | Wheeler.....             | 8,335        |
| Do.....                                            | Wheeler.....             | 11,069       |
| Sunoe.....                                         | Toner.....               | 264          |
| Surveyors' Wells .....                             | Wheeler.....             | 3,567        |
| Susanville .....                                   | Wheeler.....             | 4,195        |
| Suspension Bridge, Mokelumne River .....           | Wheeler.....             | 2,092        |
| Sutler .....                                       | Toner.....               | 919          |
| Swanns' Ranch, E. Walker River .....               | Wheeler.....             | 5,042        |
| Sweetwater Mountain .....                          | Wheeler.....             | 11,778       |
| Sycamore .....                                     |                          | 302          |
| Sycamore Grove.....                                | Wheeler.....             | 447          |
| Tahoe City .....                                   | Wheeler.....             | 6,252        |
| Tahoe Lake .....                                   | R. R. Reports.....       | 6,247        |
| Tamalpais, Mount.....                              | Whitney.....             | 2,597        |
| Tamarac.....                                       |                          | 6,209        |
| Tamarack Flat .....                                | Wheeler.....             | 6,234        |
| Tannery .....                                      | Wheeler.....             | 4,400        |
| Tapo Ranch.....                                    | Wheeler.....             | 1,373        |
| Tassett .....                                      |                          | 83           |
| Taylor's Ranch.....                                | Wheeler.....             | 1,047        |
| Taylorville.....                                   | Wheeler.....             | 3,479        |
| Tehachapai, Mount.....                             | Wheeler (Theod.).....    | 9,214        |
| Tehachapai Pass .....                              | Wheeler.....             | 3,832        |
| Tehama.....                                        | C. P. R. R.....          | 222          |
| Tejon, Fort .....                                  | Med. Dept. U. S. A.....  | 3,240        |
| Do.....                                            | Wheeler.....             | 3,245        |
| Tejon Pass.....                                    | P. R. R. Reports.....    | 5,364        |
| Tejon Ranch .....                                  | Wheeler.....             | 1,450        |
| Telegraph Hill .....                               | U. S. C. & G. S.....     | 300          |
| Telescope Mountain.....                            | Wheeler (Theod.).....    | 10,937       |
| Temescal Mountain.....                             | Wheeler (Theod.).....    | 5,730        |
| Thomas Rauch .....                                 | Wheeler.....             | 3,772        |

| Station.                            | Authority.                  | Elevation.   |
|-------------------------------------|-----------------------------|--------------|
|                                     |                             | <i>Fect.</i> |
| Thompson .....                      | C. P. R. R. ....            | 9            |
| Thompson's .....                    | Wheeler .....               | 2, 114       |
| Thompson's Ferry .....              | Wheeler .....               | 188          |
| Thompson's Peak .....               | Wheeler .....               | 7, 752       |
| Thunder Mountain .....              | Wheeler .....               | 9, 121       |
| Tilley's Ranch .....                | Wheeler .....               | 2, 609       |
| Tipton .....                        | C. P. R. R. ....            | 267          |
| Todos Santos Pass .....             | P. R. R. Reports .....      | 637          |
| Toolucha Peak .....                 | Wheeler .....               | 7, 022       |
| Tomas Bay .....                     | U. S. C. & G. S. ....       | 673          |
| Topeail Rock .....                  | U. S. C. & G. S. ....       | 81           |
| Towler's, Napa Valley .....         |                             | 369          |
| Town Talk .....                     | Nev. Co. N. G. R. R. ....   | 2, 774       |
| Tragedy Spring .....                | Wheeler .....               | 7, 989       |
| Trinchera .....                     | Wheeler .....               | 7, 567       |
| Trinidad .....                      |                             | 5, 820       |
| Trout Meadows .....                 | Wheeler .....               | 5, 998       |
| Truckee .....                       | C. P. R. R. ....            | 5, 819       |
| Do .....                            | Wheeler .....               | 5, 795       |
| Truckee Pass .....                  | P. R. R. Reports .....      | 7, 200       |
| Truebody .....                      | C. P. R. R. ....            | 88           |
| Tulare .....                        | C. P. R. R. ....            | 282          |
| Tulare Lake .....                   | Pacific R. R. Reports ..... | 398          |
| Tull Flat .....                     | Wheeler .....               | 5, 594       |
| Tullock .....                       | Toner .....                 | 106          |
| Tuolumne Grove .....                | Wheeler .....               | 5, 794       |
| Turner's Ranch, Sierra Valley ..... | Wheeler .....               | 4, 904       |
| Tuttletown .....                    | Wheeler .....               | 1, 321       |
| Twin Lake .....                     | Wheeler .....               | 5, 106       |
| Twin Peak .....                     | Wheeler .....               | 8, 824       |
| Twin Peaks .....                    | Whitney .....               | 8, 925       |
| Twist's Ranch .....                 | Wheeler .....               | 1, 121       |
| Tyler's Ranch .....                 | Wheeler .....               | 4, 402       |
| Uhl's Ranch .....                   | Wheeler .....               | 2, 662       |
| Union Camp .....                    | Smithsonian Inst. ....      | 54           |
| Union Hill .....                    | Nev. Co. N. G. R. R. ....   | 2, 706       |
| Vacaville .....                     | Toner .....                 | 175          |
| Valla Citron .....                  | Emory .....                 | 1, 539       |
| Vallecito .....                     | Toner .....                 | 1, 643       |
| Do . . . Post-Office .....          | Wheeler .....               | 1, 748       |
| Valejo .....                        | U. S. C. & G. S. ....       | 87           |
| Do .....                            | U. S. C. & G. S. ....       | 371          |
| Vallejo (North) .....               | C. P. R. R. ....            | 26           |
| Vallejo (South) .....               | C. P. R. R. ....            | 13           |
| Vergennes Ranch .....               | Wheeler .....               | 940          |
| Vina .....                          |                             | 211          |
| Visalia .....                       | Williamson .....            | 384          |
| Visalia, Signal Station .....       | U. S. Signal Office .....   | 348          |
| Volcano .....                       | Wheeler .....               | 2, 075       |
| Wabler Lake House .....             | Wheeler .....               | 6, 804       |
| Wades' Meadows .....                | Wheeler .....               | 4, 567       |
| Wades' Peak .....                   | Wheeler .....               | 7, 153       |
| Wahguyhe Mountain .....             | Wheeler (Theod.) .....      | 8, 527       |
| Walker's Pass .....                 | P. R. R. Reports .....      | 5, 302       |
| Do .....                            | Wheeler .....               | 5, 322       |
| Wallace's Ranch, Warner Lake .....  | Wheeler .....               | 4, 487       |
| Walnut Grove .....                  | C. P. R. R. ....            | 308          |
| Warm Springs .....                  | C. P. R. R. ....            | 46           |
| Warm Springs, Sonora Road .....     | Wheeler .....               | 7, 385       |
| Warner's Pass .....                 | P. R. R. Reports .....      | 3, 870       |
| Warner's Ranch .....                | P. R. R. Reports .....      | 3, 022       |
| Warren's Peak .....                 | Wheeler .....               | 9, 668       |
| Washington, Mount .....             | Wheeler .....               | 10, 802      |
| Washington Quarts Mill .....        | Wheeler .....               | 1, 032       |

| Station.                                                                                 | Authority.                | Elevation.   |
|------------------------------------------------------------------------------------------|---------------------------|--------------|
|                                                                                          |                           | <i>Feet.</i> |
| Watsonville.....                                                                         | .....                     | 45           |
| Waucoba Peak .....                                                                       | Wheeler.....              | 11,267       |
| Webster .....                                                                            | C. P. R. R. ....          | 24           |
| Welden .....                                                                             | Wheeler.....              | 2,668        |
| Welds .....                                                                              | Wheeler.....              | 2,217        |
| Wellington Mountain.....                                                                 | Wheeler.....              | 7,665        |
| West Point.....                                                                          | Wheeler.....              | 2,749        |
| West's Ranch .....                                                                       | Wheeler.....              | 596          |
| Wheatland.....                                                                           | C. P. R. R. ....          | 84           |
| White Granite Mountain.....                                                              | Wheeler.....              | 7,045        |
| White Rock .....                                                                         | S. P. R. R. ....          | 495          |
| Whitney .....                                                                            | Wheeler.....              | 10,061       |
| Whitney Meadows .....                                                                    | Wheeler.....              | 9,371        |
| Whitney, Mt. ....                                                                        | Whitney .....             | 14,898       |
| Wellington Mountain .....                                                                | Wheeler.....              | 7,665        |
| Wild Rose Spring .....                                                                   | Wheeler.....              | 4,683        |
| Wiley's Station, Amador Road .....                                                       | Wheeler.....              | 5,027        |
| Williamson River .....                                                                   | Wheeler.....              | 4,387        |
| Williamson's Lake .....                                                                  | .....                     | 2,588        |
| Willow Lake .....                                                                        | Wheeler.....              | 5,382        |
| Willow Ranch .....                                                                       | Wheeler.....              | 4,275        |
| Willow Spring .....                                                                      | Wheeler.....              | 420          |
| Willow Spring (Head of Willow Creek) .....                                               | Wheeler.....              | 5,084        |
| Willow Tree Spring .....                                                                 | Wheeler.....              | 2,500        |
| Wilson's Ranch .....                                                                     | Wheeler.....              | 1,115        |
| Woodford's .....                                                                         | Wheeler.....              | 5,676        |
| Woodland, Junction with N. R. R. ....                                                    | C. P. R. R. ....          | 63           |
| Do.....                                                                                  | U. S. C. & G. S. ....     | 58           |
| Woods Peak .....                                                                         | Whitney .....             | 10,552       |
| Workman's Hill .....                                                                     | Wheeler.....              | 1,363        |
| Workman's Ranch .....                                                                    | Wheeler.....              | 362          |
| Wright Lake.....                                                                         | P. R. R. Reports .....    | 4,470        |
| Yellowbally.....                                                                         | Petermann .....           | 8,000        |
| Yankee Jim's .....                                                                       | .....                     | 3,185        |
| Yerba Buena .....                                                                        | U. S. C. & G. S. ....     | 345          |
| Yosemite Valley .....                                                                    | Whitney .....             | 4,060        |
| Yosemite Valley (cliffs and domes about it<br>range from 7,000 to 9,900 feet above sea). | Williamson.....           | 3,935        |
| You Bet.....                                                                             | Nev. Co. N. G. R. R. .... | 2,172        |
| Yountville .....                                                                         | C. P. R. R. ....          | 97           |
| Do.....                                                                                  | Cal. P. R. R. ....        | 105          |
| Yreka .....                                                                              | Williamson.....           | 2,731        |
| Yreka Gap .....                                                                          | Whitney .....             | 6,642        |

# COLORADO.

| Station.                            | Authority.                 | Elevation.   |
|-------------------------------------|----------------------------|--------------|
|                                     |                            | <i>Feet.</i> |
| Abeysa Pass.....                    | Hayden .....               | 9,300        |
| Do .....                            | D. & R. G. R. R. ....      | 9,399        |
| Acequia .....                       | D. & R. G. R. R. ....      | 5,508        |
| Ada Spring .....                    | King .....                 | 9,279        |
| Eolus, Mount .....                  | Hayden .....               | 14,064       |
| Do .....                            | Wheeler .....              | 14,211       |
| Agate .....                         | K. P. R. R. ....           | 5,458        |
| Agency Knob .....                   | Wheeler .....              | 12,274       |
| Akron .....                         | R. V. & B. & C. R. R. .... | 4,656        |
| Alamosa, San Juan Junc .....        | D. & R. G. R. R. ....      | 7,524        |
| Alden's Junction .....              | Wheeler .....              | 8,961        |
| Alder's Junction .....              | Wheeler .....              | 8,905        |
| Alicante .....                      | D. & R. G. R. R. ....      | 11,148       |
| Alkaline Station .....              | Wheeler .....              | 4,136        |
| Allen's .....                       | D. & R. R. R. G. ....      | 9,428        |
| Allen's Park .....                  | Hayden .....               | 8,513        |
| Alma .....                          | Wheeler .....              | 10,254       |
| Altar Peak .....                    | Wheeler .....              | 13,254       |
| Americus .....                      | D. & R. G. R. R. ....      | 8,118        |
| Anderson's Ranch .....              | Wheeler .....              | 4,249        |
| Animas City.....                    | D. & R. G. R. R. ....      | 6,532        |
| Do .....                            | Wheeler .....              | 6,622        |
| Anita Peak .....                    | King .....                 | 10,661       |
| Antelope Park .....                 | Hayden .....               | 6,433        |
| Antelope Pass.....                  | R. R. Surveys .....        | 8,050        |
| Antero, Mount.....                  | Wheeler .....              | 13,863       |
| Do .....                            | Hayden .....               | 14,245       |
| Antonita .....                      | D. & R. G. R. R. ....      | 7,866        |
| Apache .....                        | D. & R. G. R. R. ....      | 5,917        |
| Apishapa .....                      | D. & R. G. R. R. ....      | 6,137        |
| Arapahoe .....                      | K. & P. R. R. ....         | 4,006        |
| Arapahoe Peak .....                 | Hayden .....               | 13,520       |
| Do .....                            | Hayden .....               | 11,100       |
| Arboles .....                       | D. & R. G. R. R. ....      | 5,991        |
| Argentine Pass.....                 | Wheeler .....              | 13,286       |
| Argo .....                          | C. C. R. R. ....           | 5,214        |
| Arkansas Bridge.....                | Wheeler .....              | 7,741        |
| Arkansas, Mount.....                | Hayden .....               | 13,647       |
| Arkansas Pass.....                  | Wheeler .....              | 11,445       |
| Aroyo .....                         | K. P. R. R. ....           | 4,648        |
| Arvada .....                        | C. C. R. R. ....           | 5,322        |
| Athal Divide.....                   | D. P. R. R. ....           | 6,301        |
| Audubon, Mount, Timber line on..... | Hayden .....               | 11,325       |
| Badger .....                        | D. & R. G. R. R. ....      | 6,743        |
| Badito .....                        | Wheeler .....              | 6,387        |
| Do .....                            | Ruffner .....              | 6,530        |
| Baker's Mine .....                  | Whitney .....              | 11,956       |
| Bakersville.....                    | Hayden .....               | 9,753        |
| Do .....                            | G. L. & S. J. R. R. ....   | 9,676        |
| Bald Mountain.....                  | Hayden .....               | 11,493       |
| Do .....                            | Hayden .....               | 11,100       |
| Baldy .....                         | D. & R. G. R. R. ....      | 7,592        |
| Baldy Peak .....                    | Hayden .....               | 14,176       |
| Banded Peak.....                    | Wheeler .....              | 12,824       |
| Do .....                            | Hayden .....               | 12,860       |
| Barnes .....                        | D. & R. G. R. R. ....      | 6,207        |
| Basalt Peak.....                    | Hayden .....               | 11,906       |



| Station.                         | Authority.                  | Elevation.   |
|----------------------------------|-----------------------------|--------------|
|                                  |                             | <i>Feet.</i> |
| Basalt Peak .....                | Wheeler .....               | 11,565       |
| Bear Creek .....                 | G. & S. P. R. R. ....       | 5,547        |
| Bear Creek Pass .....            | Hayden .....                | 12,600       |
| Do .....                         | Wheeler .....               | 11,606       |
| Bear Creek Station .....         | Parry .....                 | 7,198        |
| Beaver Brook .....               | C. C. R. R. ....            | 6,391        |
| Beaver Creek .....               | D. & R. G. R. R. ....       | 4,976        |
| Belden .....                     | D. & R. G. R. R. ....       | 8,346        |
| Bellevue Peak .....              | Wheeler .....               | 12,673       |
| Do .....                         | Hayden .....                | 12,350       |
| Bennett .....                    | K. P. R. R. ....            | 5,496        |
| Bent Cañon .....                 | Wheeler .....               | 4,696        |
| Benton .....                     | D. & R. G. R. R. ....       | 6,941        |
| Bergen Peak .....                | Hayden .....                | 9,555        |
| Bergen's Mountain .....          | Hayden .....                | 9,773        |
| Bergen's Park .....              | Hayden .....                | 7,643        |
| Bergen's Ranch .....             | Parry .....                 | 7,752        |
| Berthoud Pass .....              | Parry .....                 | 11,349       |
| Do .....                         | U. P. R. R. Surveys ..      | 11,350       |
| Bessemer .....                   | D. & R. G. R. R. ....       | 4,751        |
| Big Hill .....                   | C. C. R. R. ....            | 6,823        |
| Big Lake (San Luis Valley) ..... | Wheeler .....               | 7,478        |
| Bird's Eye .....                 | D. & R. G. R. R. ....       | 10,161       |
| Bismarck P. O. ....              | Wheeler .....               | 7,736        |
| Bison Peak .....                 | Hayden .....                | 12,237       |
| Blackburn .....                  | D. & R. G. R. R. ....       | 7,357        |
| Black Hawk .....                 | C. C. R. R. ....            | 8,031        |
| Do .....                         | Whitney .....               | 7,543        |
| Blackhead .....                  | Hayden .....                | 12,514       |
| Blackwell .....                  | A. T. & S. F. R. R. ....    | 3,573        |
| Blair .....                      | E. V. & B. O. C. R. R. .... | 4,705        |
| Blaine, Mt. ....                 | Wheeler (Theod) .....       | 14,249       |
| Do .....                         | Wheeler .....               | 13,905       |
| Blanca Peak .....                | Wheeler .....               | 14,269       |
| Do .....                         | Hayden .....                | 14,464       |
| Blodget's Peak .....             | Hayden .....                | 9,500        |
| Boon .....                       | A. T. & S. F. R. R. ....    | 4,458        |
| Borst's .....                    | D. & R. G. R. R. ....       | 6,811        |
| Boulder .....                    | G. B. & C. R. R. ....       | 5,308        |
| Do .....                         | Parry .....                 | 5,536        |
| Boulder Pass .....               | Hayden .....                | 11,670       |
| Do .....                         | V. P. R. R. Surveys ..      | 11,900       |
| Boulder Peak .....               | Wheeler .....               | 12,417       |
| Boundary Peak .....              | Hayden .....                | 12,840       |
| Box Elder .....                  | K. P. R. R. ....            | 5,528        |
| Bradford Junction .....          | Parry .....                 | 8,069        |
| Brant's Junction .....           | D. & R. G. R. R. ....       | 9,893        |
| Brazos Peak .....                | Hayden .....                | 11,274       |
| Breckenridge .....               | Whitney .....               | 9,674        |
| Breckenridge Pass .....          | Wheeler .....               | 11,503       |
| Bridgeport .....                 | D. & R. G. R. R. ....       | 4,727        |
| Brighton .....                   | D. P. R. R. ....            | 4,979        |
| Bristol Head .....               | Hayden .....                | 12,800       |
| Do .....                         | Wheeler (Theod) .....       | 12,637       |
| Bross, Mt. ....                  | Hayden .....                | 9,468        |
| Brownville .....                 | G. L. & S. J. ....          | 9,151        |
| Brush .....                      | E. V. & B. & C. R. R. ....  | 4,235        |
| Buck Mountain .....              | King .....                  | 10,877       |
| Buckskin Mountain .....          | Hayden .....                | 14,296       |
| Buena Vista .....                | D. & R. G. R. R. ....       | 7,948        |
| Do..... S. P. Switch No. 1 ..... | D. & R. G. R. R. ....       | 7,921        |
| Do..... S. P. Switch No. 2 ..... | D. & R. G. R. R. ....       | 7,927        |
| Buffalo, Mount .....             | Wheeler .....               | 13,755       |
| Buffalo Peak .....               | Hayden .....                | 13,541       |

| Station.                            | Authority.                 | Elevation.   |
|-------------------------------------|----------------------------|--------------|
|                                     |                            | <i>Feet.</i> |
| Buffalo Peak .....                  | Wheeler .....              | 13,323       |
| Do..... Timber line on .....        | Hayden .....               | 12,041       |
| Buffalo Springs, South Park .....   | Wheeler .....              | 8,952        |
| Do..... .....                       | Whitney .....              | 8,901        |
| Burlington .....                    | .....                      | 4,976        |
| Burnham .....                       | D. & R. G. R. R. ....      | 5,220        |
| Burrongs' .....                     | Wheeler .....              | 10,878       |
| Butte Valley P. O. ....             | Wheeler .....              | 5,894        |
| Byers .....                         | K. P. R. R. ....           | 5,203        |
| Byers, Mount. ....                  | Hayden .....               | 12,778       |
| Do..... Timber line on .....        | Hayden .....               | 11,400       |
| Cactus .....                        | D. & R. G. R. R. ....      | 4,859        |
| Cadillac .....                      | A., T. & S. F. R. R. ....  | 3,756        |
| Calumet .....                       | D. & R. G. R. R. ....      | 8,849        |
| Cambria .....                       | G. & S. P. R. R. ....      | 5,944        |
| Cammel Peak .....                   | King .....                 | 9,158        |
| Cameron's Cone .....                | Hayden .....               | 11,460       |
| Cameron, Mount .....                | .....                      | 14,000       |
| Cambry, Mount. ....                 | Hayden .....               | 13,274       |
| Do..... .....                       | Wheeler .....              | 13,356       |
| Cannfield .....                     | D. & B. V. R. R. ....      | 5,048        |
| Cannon City .....                   | Wheeler .....              | 5,396        |
| Do..... (Old Depot) .....           | D. & R. G. R. R. ....      | 5,320        |
| Do..... (New Depot) .....           | D. & R. G. R. R. ....      | 5,322        |
| Do..... (Leadville Junc.) .....     | D. & R. G. R. R. ....      | 5,313        |
| Do..... (Grape Creek) .....         | D. & R. G. R. R. ....      | 5,357        |
| Capitol Mountain .....              | Hayden .....               | 13,997       |
| Caraccas .....                      | D. & R. G. R. R. ....      | 6,151        |
| Carboneria .....                    | D. & R. G. R. R. ....      | 6,402        |
| Carbon Mountain .....               | Wheeler .....              | 12,078       |
| Caribou .....                       | .....                      | 9,167        |
| Do. Planters' Hotel .....           | Hayden .....               | 9,905        |
| Carlie Springs .....                | D. & R. G. R. R. ....      | 4,929        |
| Carlton .....                       | A., T. & S. F. R. R. ....  | 3,517        |
| Carlin .....                        | D. P. R. R. ....           | 5,696        |
| Carlin City .....                   | R. V. & B. & C. R. R. .... | 4,357        |
| Carlin's Cabin, Antelope Park ..... | Wheeler .....              | 9,989        |
| Cascade Hill .....                  | D. & R. G. R. R. ....      | 7,763        |
| Cascade's .....                     | D. & R. G. R. R. ....      | 4,982        |
| Cascade Peak .....                  | Hayden .....               | 14,115       |
| Cascade Rock .....                  | D. & R. G. R. R. ....      | 6,198        |
| Caslin .....                        | A., T. & S. F. R. R. ....  | 4,234        |
| Cebolla .....                       | D. & R. G. R. R. ....      | 7,330        |
| Cedar Creek .....                   | D. & R. G. R. R. ....      | 6,728        |
| Cedar Point .....                   | K. P. R. R. ....           | 5,712        |
| Central City .....                  | C. C. R. R. ....           | 8,484        |
| Do..... .....                       | Parry .....                | 8,300        |
| Centreville .....                   | Wheeler .....              | 7,727        |
| Cerro .....                         | D. & R. G. R. R. ....      | 7,942        |
| Chama Peak .....                    | Wheeler .....              | 12,248       |
| Chandler Creek Junction .....       | D. & R. G. R. R. ....      | 5,193        |
| Cheyenne Mountain .....             | Hayden .....               | 9,948        |
| Cheyenne Wells .....                | K. P. R. R. ....           | 4,277        |
| Chicago Lake .....                  | Hayden .....               | 11,500       |
| Chico .....                         | A., T. & S. F. R. R. ....  | 4,530        |
| Chicosa .....                       | Wheeler .....              | 6,076        |
| Do..... .....                       | D. & R. G. R. R. ....      | 6,095        |
| Chief .....                         | Hayden .....               | 11,833       |
| Chimney Gulch .....                 | C. C. R. R. ....           | 5,909        |
| Christlake .....                    | Toner .....                | 7,186        |
| Cimarron .....                      | D. & R. G. R. R. ....      | 6,874        |
| Cinnamon Mountain .....             | Hayden .....               | 12,600       |
| Clark's Peak .....                  | King .....                 | 13,167       |
| Clayton Cone .....                  | Hayden .....               | 9,560        |

| Station.                              | Authority.                 | Elevation.   |
|---------------------------------------|----------------------------|--------------|
|                                       |                            | <i>Feet.</i> |
| Clelland .....                        | A., T. & S. F. R. R. ....  | 5,145        |
| Cleora .....                          | D. & R. G. R. R. ....      | 6,993        |
| Cloud City .....                      | D. & R. G. R. R. ....      | 8,940        |
| Coal Creek .....                      | D. & R. G. R. R. ....      | 5,338        |
| Coal Junction .....                   | D. & R. G. R. R. ....      | 6,186        |
| Coal Mountain .....                   | King .....                 | 8,430        |
| Cochetopa .....                       | D. & R. G. R. R. ....      | 7,921        |
| Cochetopa Dome .....                  | Wheeler .....              | 11,673       |
| Cochetopa or Los Pinos Agency .....   | Wheeler .....              | 9,068        |
| Cochetopa Pass .....                  | Wheeler .....              | 10,032       |
| Do .....                              | P. R. R. Reports .....     | 10,032       |
| Do .....                              | Hayden .....               | 10,000       |
| Coffintop .....                       | Hayden .....               | 8,003        |
| Coke Ovens .....                      | D. & R. G. R. R. ....      | 5,932        |
| Colfax .....                          | Wheeler .....              | 8,599        |
| Colina .....                          | D. & R. G. R. R. ....      | 6,712        |
| Collins, Fort .....                   | Toner .....                | 4,815        |
| Colorado City .....                   | D. & R. G. R. R. ....      | 6,092        |
| Do .....                              | Parry .....                | 6,344        |
| Do .....                              | Hayden .....               | 6,049        |
| Colorado Springs .....                | Wheeler .....              | 6,010        |
| Do .....                              | D. & R. G. R. R. ....      | 5,970        |
| Do .....                              | D. & R. G. R. R. ....      | 5,967        |
| Do .....                              | D. & R. G. R. R. ....      | 5,960        |
| Do .....                              | U. S. Signal Office .....  | 6,032        |
| Comanche Peak .....                   | King .....                 | 11,929       |
| Conejos .....                         | Hayden .....               | 7,880        |
| Do .....                              | Wheeler .....              | 7,435        |
| Conejos Peak .....                    | Hayden .....               | 13,183       |
| Conical Butte .....                   | Hayden .....               | 9,848        |
| Corliss Springs .....                 | .....                      | 5,985        |
| Corona .....                          | R. V. & B. & C. R. R. .... | 4,547        |
| Corral Peak .....                     | Hayden .....               | 11,333       |
| Costilla .....                        | Wheeler .....              | 7,551        |
| Costilla Pass .....                   | Palmer .....               | 9,520        |
| Cotopaxi .....                        | D. & R. G. R. R. ....      | 6,364        |
| Cottonwood .....                      | C. C. R. R. ....           | 7,178        |
| Coxo .....                            | D. & R. G. R. R. ....      | 9,731        |
| Cranes Park .....                     | D. & R. G. R. R. ....      | 10,097       |
| Crescent Peak .....                   | King .....                 | 10,255       |
| Crested Butte (Mt.) .....             | Hayden .....               | 12,052       |
| Do .....                              | D. & R. G. R. R. ....      | 8,871        |
| Crested Butte (Irwin Junction) .....  | D. & R. G. R. R. ....      | 8,853        |
| Crestone .....                        | Hayden .....               | 14,233       |
| Do .....                              | Wheeler .....              | 13,190       |
| Crestone, timber line on .....        | Wheeler .....              | 12,107       |
| Crooks .....                          | D. & R. G. R. R. ....      | 8,144        |
| Crystal Creek .....                   | D. & R. G. R. R. ....      | 6,869        |
| Crystal Lake .....                    | D. & R. G. R. R. ....      | 9,389        |
| Cub Mountain .....                    | Hayden .....               | 10,623       |
| Cucamonga Peak .....                  | Wheeler .....              | 8,529        |
| Cucharas .....                        | D. & R. G. R. R. ....      | 5,921        |
| Cucharas (El Moro) Junction .....     | .....                      | 5,925        |
| Cucharas Pass .....                   | Wheeler .....              | 9,994        |
| Cuerno Verde Peak .....               | Wheeler .....              | 12,341       |
| Culebra Church .....                  | Wheeler .....              | 8,010        |
| Culebra Peak .....                    | Hayden .....               | 14,069       |
| Cumbres .....                         | D. & R. G. R. R. ....      | 9,993        |
| Cunningham Pass .....                 | Hayden .....               | 12,090       |
| Cunningham Pass, Timber line on ..... | Hayden .....               | 11,500       |
| Curaseo .....                         | D. & R. G. R. R. ....      | 4,493        |
| Curecanti .....                       | D. & R. G. R. R. ....      | 7,052        |
| Currant Creek Pass .....              | Wheeler .....              | 9,654        |
| Daly, Mt. ....                        | Hayden .....               | 13,193       |

| Station.                             | Authority.                     | Elevation.   |
|--------------------------------------|--------------------------------|--------------|
|                                      |                                | <i>Feet.</i> |
| Dayton .....                         | Hayden .....                   | 9,441        |
| Do .....                             | Wheeler .....                  | 9,333        |
| Deer Trail .....                     | K. P. R. R. ....               | 5,185        |
| Del Norte .....                      | Wheeler .....                  | 7,743        |
| Do .....                             | Hayden .....                   | 7,750        |
| Do .....                             | D. & R. G. R. R. ....          | 7,858        |
| Del Norte Hill .....                 | Wheeler .....                  | 8,218        |
| Del Norte Peak .....                 | Wheeler .....                  | 13,084       |
| Delta .....                          | D. & R. G. R. R. ....          | 4,947        |
| Denver Union Depot .....             | Mean result of R. R. levels .. | 5,175        |
| Do .. Junction .....                 | D. P. R. R. ....               | 5,184        |
| Do .. signal station .....           | U. S. Signal Office ..         | 5,294        |
| Derby .....                          | R. V. & B. & C. R. R. ....     | 5,159        |
| Derby, Mt. ....                      | Hayden .....                   | 12,253       |
| Diamond Peak .....                   | King .....                     | 9,925        |
| Dillon (Breckenridge Junction) ..... | D. & R. G. R. R. ....          | 8,852        |
| Divide .....                         | D. & R. G. R. R. ....          | 7,216        |
| Dominques .....                      | D. & R. G. R. R. ....          | 4,771        |
| Dora .....                           | D. & R. G. R. R. ....          | 7,617        |
| Dodson's Ranch .....                 | Wheeler .....                  | 6,379        |
| Douglas .....                        | D. & R. G. R. R. ....          | 6,303        |
| Doyle .....                          | D. & R. G. R. R. ....          | 8,035        |
| Dugley .....                         | D. & S. P. R. R. ....          | 10,339       |
| Dumont .....                         | C. C. R. R. ....               | 7,924        |
| Dunn's Peak .....                    | Wheeler .....                  | 13,502       |
| Durango, passenger depot .....       | D. & R. G. R. R. ....          | 6,498        |
| Do .. freight depot .....            | D. & R. G. R. R. ....          | 6,505        |
| Eagle Park .....                     | D. & R. G. R. R. ....          | 9,205        |
| Do .....                             | Hayden .....                   | 8,440        |
| Eagle River Peak .....               | Hayden .....                   | 12,648       |
| Earl .....                           | A. T. & S. F. R. R. ....       | 5,671        |
| East Mountain .....                  | King .....                     | 7,588        |
| East River Pass .....                | Hayden .....                   | 11,163       |
| Eckley .....                         | R. V. & B. & C. R. R. ....     | 3,879        |
| Edgerton .....                       | D. & R. G. R. R. ....          | 6,332        |
| Eighteen-mile Mountain .....         | Wheeler .....                  | 12,278       |
| Eiler's .....                        | D. & R. G. R. R. ....          | 9,836        |
| Eiler's Junction .....               | D. & R. G. R. R. ....          | 9,828        |
| Eiler's Smelter Junction .....       | D. & R. G. R. R. ....          | 9,828        |
| Elbert, Mt. ....                     | Hayden .....                   | 14,351       |
| Do .. Timber line on .....           | Hayden .....                   | 11,871       |
| Elk Mountain .....                   | Wheeler .....                  | 13,101       |
| Elk Park .....                       | D. & R. G. R. R. ....          | 8,761        |
| El Laté .....                        | Hayden .....                   | 9,840        |
| El Moro .....                        | D. & R. G. R. R. ....          | 5,857        |
| El Moro Mines .....                  | D. & R. G. R. R. ....          | 6,537        |
| Empire .....                         | Parry .....                    | 8,583        |
| Do .....                             | C. C. R. R. ....               | 8,245        |
| Engineer Mountain .....              | Hayden .....                   | 12,971       |
| Do .....                             | Wheeler .....                  | 13,277       |
| Englemann, Mt., Timber line on ..... | Hayden .....                   | 11,578       |
| Erie .....                           | D. & B. V. R. R. ....          | 5,024        |
| Escalante .....                      | D. & R. G. R. R. ....          | 4,814        |
| Ethel Peak .....                     | King .....                     | 11,976       |
| Evans .....                          | Hayden .....                   | 4,745        |
| Do .....                             | D. P. R. R. ....               | 4,646        |
| Do .....                             | King .....                     | 4,775        |
| Evans, Mount .....                   | Hayden .....                   | 14,330       |
| Do .....                             | Wheeler .....                  | 14,321       |
| Do .. Timber line on .....           | Wheeler .....                  | 11,723       |
| Do .. Timber line on .....           | Hayden .....                   | 11,300       |
| Excelsior .....                      | D. & R. G. R. R. ....          | 4,895        |
| Fairplay .....                       | Wheeler .....                  | 10,076       |
| Do .....                             | Whitney .....                  | 9,946        |

| Station.                                          | Authority.                  | Elevation.   |
|---------------------------------------------------|-----------------------------|--------------|
|                                                   |                             | <i>Feet.</i> |
| Fairplay .....                                    | D. & S. P. R. R. ....       | 9,941        |
| Fall River .....                                  | Whitney .....               | 7,708        |
| Do .....                                          | C. C. R. R. ....            | 7,665        |
| Farnham's Ranch .....                             | Hayden .....                | 9,548        |
| Farnum's Peak .....                               | Hayden .....                | 11,400       |
| First View .....                                  | K. P. R. R. ....            | 4,577        |
| Fish Creek .....                                  | .....                       | 6,889        |
| Fisher's Peak .....                               | Hayden .....                | 9,460        |
| Flora, Mount .....                                | Parry .....                 | 12,878       |
| Florida .....                                     | D. & R. G. R. R. ....       | 6,695        |
| Florissant .....                                  | Wheeler .....               | 8,184        |
| Floyd Hill .....                                  | C. C. R. R. ....            | 7,201        |
| Fork's Creek .....                                | C. C. R. R. ....            | 6,878        |
| Fountain .....                                    | D. & R. G. R. R. ....       | 5,503        |
| France's Coal Mine .....                          | Hayden .....                | 6,693        |
| Freeman's Peak .....                              | Hayden .....                | 11,600       |
| French Pass .....                                 | Wheeler .....               | 12,044       |
| Frisco .....                                      | D. & R. G. R. R. ....       | 9,064        |
| Frustrum Mountain .....                           | Wheeler .....               | 13,893       |
| Galena Mountain .....                             | Hayden .....                | 13,290       |
| Gardner .....                                     | Wheeler .....               | 6,956        |
| Do .....                                          | Hayden .....                | 7,000        |
| Garland, Fort .....                               | Wheeler .....               | 7,849        |
| Do .....                                          | D. & R. G. R. R. ....       | 7,914        |
| Do .....                                          | Hayden .....                | 7,996        |
| Do .....                                          | Wheeler, R. R. levels ..... | 7,937        |
| Garlick's Ranch .....                             | Parry .....                 | 7,105        |
| Georgetown .....                                  | C. C. R. R. ....            | 8,474        |
| Do .....                                          | Parry .....                 | 8,452        |
| Do .....                                          | Wheeler .....               | 8,587        |
| Do .....                                          | Whitney .....               | 8,594        |
| Georgia Pass .....                                | Wheeler .....               | 11,770       |
| Do .....                                          | Parry .....                 | 11,487       |
| Do .....                                          | Hayden .....                | 11,811       |
| Gibson Peak .....                                 | Wheeler .....               | 13,729       |
| Girardodt .....                                   | D. & R. G. R. R. ....       | 6,358        |
| Glacier, Mount .....                              | Wheeler .....               | 14,243       |
| Glacier Peak .....                                | Hayden .....                | 12,654       |
| Do .....                                          | Wheeler .....               | 13,360       |
| Glade .....                                       | D. & R. G. R. R. ....       | 6,515        |
| Godfrey .....                                     | K. P. R. R. ....            | 5,603        |
| Golden .....                                      | C. C. R. R. ....            | 5,684        |
| Do .....                                          | Whitney .....               | 5,690        |
| Golden Peak .....                                 | Hayden .....                | 9,650        |
| Gold Hill .....                                   | Hayden .....                | 8,463        |
| Do .....                                          | Parry .....                 | 8,636        |
| Goodnight .....                                   | D. & R. G. R. R. ....       | 4,708        |
| Gore's Pass .....                                 | Hayden .....                | 9,570        |
| Gothic Mountain .....                             | Hayden .....                | 12,570       |
| Granada .....                                     | A. T. & S. F. R. R. ....    | 3,436        |
| Grand Junction .....                              | D. & R. G. R. R. ....       | 4,561        |
| Grand Lake .....                                  | Hayden .....                | 8,153        |
| Grand Mesa .....                                  | Hayden .....                | 10,000       |
| Granite .....                                     | D. & R. G. R. R. ....       | 8,923        |
| Do .....                                          | Hayden .....                | 8,883        |
| Grant .....                                       | D. & S. P. R. R. ....       | 8,491        |
| Do .....                                          | Hayden .....                | 8,587        |
| Do .....                                          | Wheeler .....               | 8,497        |
| Gray's Peak .....                                 | Hayden .....                | 14,341       |
| Do .....                                          | Whitney .....               | 14,319       |
| Do .....                                          | Hayden .....                | 11,100       |
| Do .....                                          | Wheeler .....               | 14,380       |
| Gray's Peak, divide between north and south ..... | Wheeler .....               | 13,929       |

| Station.                            | Authority.                 | Elevation.   |
|-------------------------------------|----------------------------|--------------|
|                                     |                            | <i>Feet.</i> |
| Greeley .....                       | D. P. R. R .....           | 4,642        |
| Do .....                            | King .....                 | 4,779        |
| Greenhorn .....                     | D. & R. G. R. R .....      | 5,076        |
| Greenhorn Mountain .....            | Hayden .....               | 12,930       |
| Greenland .....                     | D. & R. G. R. R .....      | 6,899        |
| Green Mountain .....                | Hayden .....               | 7,993        |
| Graneros .....                      | D. & R. G. R. R .....      | 5,782        |
| Griffith Mountain .....             | Wheeler .....              | 11,589       |
| Do .....                            | Hayden .....               | 11,273       |
| Grizzly Peak .....                  | Hayden .....               | 13,956       |
| Grizzly Peak, Timber line on .....  | Hayden .....               | 11,758       |
| Gunnison .....                      | Hayden .....               | 7,743        |
| Do .....                            | Wheeler .....              | 7,419        |
| Do .....                            | D. & R. G. R. R .....      | 7,658        |
| Gunnison, Crested Butte Junc .....  | D. & R. G. R. R .....      | 7,660        |
| Gunnison, Mt .....                  | Hayden .....               | 12,688       |
| Do .....                            | Wheeler .....              | 12,242       |
| Gutchels .....                      | D. & R. G. R. R .....      | 9,965        |
| Guy Gulch .....                     | C. C. R. R .....           | 6,212        |
| Guyot, Mount .....                  | Hayden .....               | 13,565       |
| Do .....                            | Parry .....                | 13,223       |
| Guyot, Mount, Timber line on .....  | Hayden .....               | 11,811       |
| Hague's Peak .....                  | King .....                 | 13,832       |
| Hall's Ranch, San Luis Valley ..... | Wheeler .....              | 7,839        |
| Hall's Smelting Works .....         | Wheeler .....              | 9,916        |
| Hamilton .....                      | Hayden .....               | 9,743        |
| Do .....                            | Whitney .....              | 9,875        |
| Hamilton Pass .....                 | Ruffner .....              | 12,370       |
| Do .....                            | Timber line on .....       | 10,840       |
| Hamilton's Ranch .....              | Wheeler .....              | 7,927        |
| Hancock Pass .....                  | Wheeler .....              | 12,263       |
| Handie's Peak .....                 | Hayden .....               | 13,997       |
| Do .....                            | Wheeler .....              | 14,149       |
| Hans Peak .....                     | King .....                 | 10,906       |
| Hardscrabble Mines .....            |                            | 8,800        |
| Harp .....                          | D. & R. G. R. R .....      | 7,323        |
| Hartzell's Ranch .....              | Wheeler .....              | 8,828        |
| Harvard, Mount .....                | Hayden .....               | 14,375       |
| Do .....                            | Whitney .....              | 14,452       |
| Do .....                            | Wheeler .....              | 14,151       |
| Do .....                            | Timber line on .....       | 12,117       |
| Hayden Pass .....                   | Wheeler .....              | 10,780       |
| Haydens .....                       | D. & R. G. R. R .....      | 9,136        |
| Haydensville .....                  |                            | 6,382        |
| Hay Station, Deer Range .....       | Wheeler .....              | 9,613        |
| Hecia .....                         | D. & R. G. R. R .....      | 7,349        |
| Helmet Peak .....                   | Hayden .....               | 12,042       |
| Henderson's Island .....            | D. P. R. R .....           | 5,028        |
| Henderson's Ranch .....             | Whitney .....              | 8,257        |
| Hepburn's Park .....                | D. & S. P. R. R .....      | 8,141        |
| Hereford .....                      | D. & R. G. R. R .....      | 4,460        |
| Hermano Peak .....                  | Hayden .....               | 9,014        |
| Hermosa .....                       | Wheeler .....              | 6,618        |
| Do .....                            | D. & R. G. R. R .....      | 6,623        |
| Hesperis Mountain .....             | Hayden .....               | 13,135       |
| Heyde .....                         | R. V. & B. & C. R. R ..... | 4,220        |
| Hilton .....                        | A., T. & S. F. R. R .....  | 3,877        |
| Hoehe's .....                       | A., T. & S. F. R. R .....  | 5,704        |
| Holley's .....                      | A., T. & S. F. R. R .....  | 3,377        |
| Holy Cross Mountain .....           | Hayden .....               | 14,176       |
| Homer .....                         | D. & R. G. R. R .....      | 8,935        |
| Homestake Peak .....                | Hayden .....               | 13,687       |
| Hoosier Pass .....                  | Wheeler .....              | 11,627       |

| Station.                                 | Authority.                         | Elevation.   |
|------------------------------------------|------------------------------------|--------------|
|                                          |                                    | <i>Feet.</i> |
| Hoosier Pass .....                       | Whitney .....                      | 11,546       |
| Do .....                                 | U. P. R. R. surveys .....          | 11,500       |
| Horseshy, Mount .....                    | Wheeler .....                      | 10,504       |
| Horseshoe Mountain .....                 | Whitney .....                      | 13,968       |
| Hot Springs .....                        | Parry .....                        | 7,725        |
| Howard's .....                           | D. & R. G. R. R. ....              | 6,692        |
| Howardville .....                        | Hayden .....                       | 9,700        |
| Do .....                                 | Wheeler .....                      | 9,527        |
| Hudson .....                             | E. V. & B. & C. R. R. ....         | 4,993        |
| Huerfano .....                           | Wheeler .....                      | 4,714        |
| Do .....                                 | D. & R. G. R. R. ....              | 5,657        |
| Hughes, Astronomical Station .....       | Wheeler .....                      | 5,021        |
| Hugo .....                               | K. P. R. R. ....                   | 5,050        |
| Hukill .....                             | C. C. R. R. ....                   | 7,626        |
| Hunchback Mountain .....                 | Wheeler .....                      | 13,755       |
| Hunt's Mountain .....                    | Wheeler .....                      | 14,054       |
| Hunt's Peak .....                        | Wheeler .....                      | 14,055       |
| Do .....                                 | Hayden .....                       | 12,333       |
| Hunt's Peak, foot of .....               | Wheeler .....                      | 10,517       |
| Hurricane Peak .....                     | Wheeler .....                      | 13,565       |
| Husted's .....                           | D. & R. G. R. R. ....              | 6,575        |
| Idaho Springs .....                      | Wheeler .....                      | 7,284        |
| Do .....                                 | C. C. R. R. ....                   | 7,541        |
| Ignacio .....                            | D. & R. G. R. R. ....              | 6,415        |
| Indian Creek Pass .....                  | Wheeler .....                      | 9,803        |
| Iron Mine .....                          | D. & R. G. R. R. ....              | 9,005        |
| Iron Springs .....                       | A., T. & S. F. R. R. ....          | 4,674        |
| Jack's Cabin .....                       | D. & R. G. R. R. ....              | 8,284        |
| James' Peak .....                        | Hayden .....                       | 13,283       |
| Do .....                                 | Timber line on .....               | 11,100       |
| Jamestown .....                          | Hayden .....                       | 7,123        |
| Jefferson .....                          | Wheeler .....                      | 9,863        |
| Do .....                                 | Hayden .....                       | 9,868        |
| Do .....                                 | Parry .....                        | 9,842        |
| Johnson .....                            | D. P. R. R. ....                   | 4,826        |
| Johnson's Ford, Umcompahgre River .....  | Wheeler .....                      | 5,702        |
| Juniata .....                            | D. & R. G. R. R. ....              | 6,319        |
| Junction House .....                     | Hayden .....                       | 8,153        |
| Junction Peak .....                      | King .....                         | 7,868        |
| Kahnah .....                             | D. & R. G. R. R. ....              | 4,649        |
| Keeldar .....                            | D. & R. G. R. R. ....              | 9,948        |
| Kelley .....                             | D. & R. G. R. R. ....              | 5,614        |
| Kelso Cabin .....                        | Hayden .....                       | 10,893       |
| Kendall, Mount .....                     | Hayden .....                       | 13,350       |
| Do .....                                 | Wheeler .....                      | 13,542       |
| Kenny's Ranch, on Dead Man's Creek ..... | Wheeler .....                      | 7,830        |
| Kenosha Cones .....                      | Hayden .....                       | { 12,350     |
|                                          |                                    | { 12,340     |
| Kenosha House .....                      | D. & S. P. R. R. ....              | 9,606        |
| Kenosha Summit .....                     | D. & S. P. R. R. ....              | 9,905        |
| Kezar .....                              | D. & R. G. R. R. ....              | 7,409        |
| Kit Carson .....                         | K. P. R. R. ....                   | 4,289        |
| Kit Carson's Peak .....                  | Hayden .....                       | 14,100       |
| Kokomo .....                             | D. & R. G. R. R. ....              | 10,609       |
| Labran .....                             | D. & R. G. R. R. ....              | 5,167        |
| Do .....                                 | Florence Coal Creek Junction ..... | 5,177        |
| Do .....                                 | Astronomical Station .....         | 5,218        |
| La Jara .....                            | D. & R. G. R. R. ....              | 7,587        |
| La Junta .....                           | Wheeler .....                      | 4,094        |
| Do .....                                 | A., T. & S. F. R. R. ....          | 4,044        |
| Do .....                                 | Wheeler .....                      | 6,612        |
| Lake .....                               | K. P. R. R. ....                   | 5,301        |
| Lake City .....                          | Wheeler .....                      | 8,753        |

| Station.                              | Authority.                | Elevation.   |
|---------------------------------------|---------------------------|--------------|
|                                       |                           | <i>Feet.</i> |
| Lake City.....                        | Hayden .....              | 8,550        |
| Lake Creek Pass .....                 | Wheeler .....             | 12,226       |
| Lake House, on slope Pike's Peak..... | Wheeler .....             | 10,108       |
| Lambert .....                         | Wheeler .....             | 6,561        |
| Lamborn, Mount .....                  | Hayden .....              | 11,337       |
| Lambton .....                         | D. & R. G. R. R. ....     | 6,537        |
| Land's End .....                      | Hayden .....              | 10,634       |
| Lane's Ranch .....                    | Wheeler .....             | 6,380        |
| La Plata.....                         | D. & R. G. R. R. ....     | 9,950        |
| La Plata Junction.....                | D. & R. G. R. R. ....     | 9,950        |
| La Plata, Mountain .....              | Wheeler .....             | 13,316       |
| Do.....                               | Hayden .....              | 14,311       |
| Do..... Timber line on.....           | Hayden .....              | 12,080       |
| Laporte .....                         | King .....                | 5,065        |
| Lariat .....                          | D. & R. G. R. R. ....     | 7,643        |
| Larkspur .....                        | D. & R. G. R. R. ....     | 6,649        |
| Las Animas (west) .....               | Wheeler .....             | 3,826        |
| Do.....                               | A., T. & S. F. R. R. .... | 3,854        |
| Latham .....                          | .....                     | 4,600        |
| La Veta .....                         | D. & R. G. R. R. ....     | 7,002        |
| La Veta Peak .....                    | Wheeler .....             | 11,654       |
| Lawson .....                          | C. C. R. R. ....          | 8,111        |
| Leadville .....                       | D. & R. G. R. R. ....     | 10,178       |
| Lennox .....                          | D. & R. G. R. R. ....     | 4,705        |
| Leonard's Ranch, Arkansas River ..... | Wheeler .....             | 8,335        |
| Leon Peak .....                       | Hayden .....              | 10,954       |
| Do.....                               | Wheeler .....             | 11,218       |
| Lillie's Mountain .....               | Hayden .....              | 11,433       |
| Do..... Timber line on.....           | Hayden .....              | 11,100       |
| Lime Kiln .....                       | D. & R. G. R. R. ....     | 5,552        |
| Do.....                               | D. & R. G. R. R. ....     | 6,219        |
| Lime Stone .....                      | D. & R. G. R. R. ....     | 4,862        |
| Lime or White Earth Creek Pass .....  | Wheeler .....             | 11,314       |
| Lincoln, Mount .....                  | Wheeler .....             | 14,375       |
| Do.....                               | Hayden .....              | 14,297       |
| Do..... Timber line on.....           | Hayden .....              | 12,051       |
| Lindstrom's Mill .....                | Parry .....               | 8,738        |
| Little Butte .....                    | D. & R. G. R. R. ....     | 5,346        |
| Little Giant.....                     | D. & R. G. R. R. ....     | 10,046       |
| Littleton .....                       | D. & R. G. R. R. ....     | 5,350        |
| Lockwood's Ranch .....                | Wheeler .....             | 4,997        |
| Loma, Camp .....                      | Ruffner .....             | 8,069        |
| Lone Cone .....                       | Hayden .....              | 12,761       |
| Long's Cañon .....                    | Wheeler .....             | 8,402        |
| Long's Pass .....                     | Palmer .....              | 7,660        |
| Long's Peak.....                      | Hayden .....              | 14,271       |
| Do.....                               | King .....                | 14,050       |
| Do..... Timber line on.....           | Hayden .....              | 11,100       |
| Los Pinos .....                       | D. & R. G. R. R. ....     | 9,615        |
| Do.. Agency .....                     | Hayden .....              | 9,290        |
| Do.....                               | Wheeler .....             | 9,065        |
| Lost Knife Pass .....                 | Palmer .....              | 8,400        |
| Lost Park Mountain.....               | Hayden .....              | 11,800       |
| Lumber Spur .....                     | D. & R. G. R. R. ....     | 9,074        |
| Lupton, Fort.....                     | D. P. R. R. ....          | 4,896        |
| Lyon, Fort.....                       | Wheeler .....             | 3,910        |
| Machiasett .....                      | .....                     | 5,520        |
| Macomb's Peak.....                    | Wheeler .....             | 13,154       |
| Madge .....                           | D. & R. G. R. R. ....     | 6,716        |
| Magnolia .....                        | K. P. R. R. ....          | 5,336        |
| Malta.....                            | D. & R. G. R. R. ....     | 9,558        |
| Do.. Lizzie Smelter Junction.....     | D. & R. G. R. R. ....     | 9,608        |
| Do.. Adobe Smelter Junction .....     | D. & R. G. R. R. ....     | 9,661        |
| Manitou .....                         | D. & R. G. R. R. ....     | 6,302        |



| Station.                           | Authority.                     | Elevat  |
|------------------------------------|--------------------------------|---------|
| Manitou .....                      | Hayden .....                   | 1       |
| Marcellina, Mount .....            | Hayden .....                   | 6       |
| Do .....                           | Wheeler .....                  | 11      |
| Marleston Peak .....               | Wheeler .....                  | 10      |
| Marmot Peak .....                  | Hayden .....                   | 11      |
| Maroon Mountain .....              | Hayden .....                   | 14      |
| Marshall .....                     | G. B. & C. R. R. ....          | 5       |
| Marshall's Pass .....              | Wheeler .....                  | 10      |
| Marshes .....                      | D. & R. G. R. R. ....          | 6       |
| Mary Lake .....                    | Toner .....                    | 9       |
| Masonville .....                   | .....                          | 6       |
| Massive Mountain .....             | Hayden .....                   | 14      |
| Do .....                           | Hayden .....                   | 11      |
| Do .....                           | Timber line on .....           | .....   |
| Maysville .....                    | D. & R. G. R. R. ....          | 8       |
| McClellan Mountain .....           | Hayden .....                   | 13      |
| Do .....                           | Wheeler .....                  | 13      |
| McClure's Ranch .....              | Wheeler .....                  | 5       |
| McLaughlin's Ranch .....           | Wheeler .....                  | 9       |
| Meadows .....                      | D. & R. G. R. R. ....          | 4       |
| Mears .....                        | D. & R. G. R. R. ....          | 8       |
| Do .....                           | Saguache Junction .....        | 8       |
| Mear's Peak .....                  | Wheeler .....                  | 13      |
| Meig's Peak .....                  | Wheeler .....                  | 13      |
| Merritt's Ranch .....              | Hayden .....                   | 7       |
| Mesa Verde .....                   | .....                          | 7,000-8 |
| Mesquite Pass .....                | Wheeler .....                  | 13      |
| Middle Boulder .....               | .....                          | 8       |
| Middle Park (mean elevation) ..... | .....                          | 7       |
| Midway .....                       | D. & R. G. R. R. ....          | 7       |
| Mill City .....                    | Toner .....                    | 7       |
| Mill No. 2 .....                   | D. & R. G. R. R. ....          | 6       |
| Mincio .....                       | D. & R. G. R. R. ....          | 9       |
| Mineral City .....                 | Wheeler .....                  | 11      |
| Mineral Creek Pass .....           | Hayden .....                   | 11      |
| Mirage .....                       | K. P. R. R. ....               | 4       |
| Missouri City .....                | Parry .....                    | 9       |
| Mitchell's .....                   | D. & R. G. R. R. ....          | 9       |
| Monitor Peak .....                 | King .....                     | 11      |
| Montezuma .....                    | Whitney .....                  | 10      |
| Do .....                           | Wheeler .....                  | 9       |
| Montgomery .....                   | Whitney .....                  | 10      |
| Do .....                           | Hayden .....                   | 11      |
| Montrose .....                     | D. & R. G. R. R. ....          | 5       |
| Monument .....                     | D. & R. G. R. R. ....          | 6       |
| Morgan, Fort .....                 | Med. Dept., U. S. A. ....      | 4       |
| Morgan's Trading Post .....        | .....                          | 6       |
| Morley .....                       | A., T. & S. F. R. R. ....      | 6       |
| Morrison, Mount .....              | Hayden .....                   | 7       |
| Mosca .....                        | .....                          | 7       |
| Mosca Pass .....                   | Wheeler .....                  | 9       |
| Do .....                           | Kans. Pac. R. R. surveys ..... | 9       |
| Do .....                           | Hayden .....                   | 9       |
| Mosquito .....                     | Wheeler .....                  | 10      |
| Mosquito Pass .....                | Wheeler .....                  | 13      |
| Muddy Creek Pass .....             | Hayden .....                   | 8       |
| Mule Shoe .....                    | D. & R. G. R. R. ....          | 8       |
| Nada .....                         | D. & R. G. R. R. ....          | 4       |
| Namagua .....                      | .....                          | 5       |
| Nathrop .....                      | D. & R. G. R. R. ....          | 7       |
| Navajo .....                       | D. & R. G. R. R. ....          | 6       |
| Navesink Mountain .....            | King .....                     | 9       |
| Nederland .....                    | Hayden .....                   | 8       |
| Needleton .....                    | D. & R. G. R. R. ....          | 8       |
| Nepesta .....                      | A., T. & S. F. R. R. ....      | 4       |

| Station.                         | Authority.                 | Elevation.   |
|----------------------------------|----------------------------|--------------|
|                                  |                            | <i>Feet.</i> |
| Nevada City .....                | A., T. & S. F. R. R. ....  | 8,800        |
| New Mexico Line .....            | A., T. & S. F. R. R. ....  | 7,556        |
| New Orleans Crossing .....       | D. & R. G. R. R. ....      | 5,239        |
| New York Ranch .....             | Whitney .....              | 7,170        |
| North Mam .....                  | Hayden .....               | 11,973       |
| North Park .....                 |                            | 8,000-9,000  |
| Oak Creek .....                  | D. & R. G. R. R. ....      | 5,331        |
| Oak Creek Junction .....         | D. & R. G. R. R. ....      | 5,187        |
| Ohio Peak .....                  | Hayden .....               | 11,972       |
| Ojo .....                        | D. & R. G. R. R. ....      | 8,167        |
| Ormus, Mount .....               | Hayden .....               | 12,185       |
| Osborn's Lake .....              | Toner .....                | 8,821        |
| Osier .....                      | D. & R. G. R. R. ....      | 9,615        |
| Oso, Mount .....                 | Hayden .....               | 13,640       |
| Otis .....                       | R. V. & B. & C. R. R. .... | 4,392        |
| Ouray .....                      | Hayden .....               | 7,640        |
| Ouray Mount .....                | Hayden .....               | 14,043       |
| Owen, Mount .....                | Hayden .....               | 12,969       |
| Oxford .....                     | A., T. & S. F. R. R. ....  | 4,322        |
| Pagoda Peak .....                | Hayden .....               | 11,251       |
| Pagosa Peak .....                | Wheeler .....              | 12,676       |
| Do .....                         | Hayden .....               | 12,674       |
| Pagosa Springs .....             | Hayden .....               | 7,095        |
| Do .....                         | Wheeler .....              | 7,108        |
| Park Cone .....                  | Hayden .....               | 12,021       |
| Park Dale .....                  | D. & R. G. R. R. ....      | 5,715        |
| Park View Peak .....             | Hayden .....               | 12,433       |
| Do .....                         | Hayden .....               | 11,100       |
| Do .....                         | Timber line on             |              |
| Parlins .....                    | D. & R. G. R. R. ....      | 7,928        |
| Parrott City .....               | Hayden .....               | 8,633        |
| Parry's Peak .....               | Parry .....                | 13,133       |
| Pasos Mountain .....             | Hayden .....               | 11,200       |
| Peale, Mount .....               | Hayden .....               | 13,004       |
| Pegasus Spring .....             | Hayden .....               | 5,650        |
| Petersburgh .....                | D. & R. G. R. R. ....      | 5,302        |
| Pidgeon's Peak .....             | Hayden .....               | 13,928       |
| Pierce .....                     | D. P. R. R. ....           | 5,026        |
| Pike's Peak .....                | U. S. Signal Office .....  | 14,147       |
| Do .....                         | Parry .....                | 14,216       |
| Do .....                         | Signal Station .....       |              |
| Do .....                         | U. S. Signal Office .....  | 14,134       |
| Do .....                         | Timber line on             |              |
| Pine Creek .....                 | Hayden .....               | 11,720       |
| Pinion .....                     | D. & R. G. R. R. ....      | 8,738        |
| Pinto Peak .....                 | D. & R. G. R. R. ....      | 5,016        |
| Pipe .....                       | Hayden .....               | 13,176       |
| Pisgah, Mount .....              | Col. Cent. R. R. ....      | 7,239        |
| Do .....                         | Hayden .....               | 10,322       |
| Pisgah Peak, Little .....        | Wheeler .....              | 10,487       |
| Placer .....                     | Wheeler .....              | 10,027       |
| Placer Iron Mine .....           | D. & R. G. R. R. ....      | 8,388        |
| Placer Iron Mine Junction .....  | D. & R. G. R. R. ....      | 8,586        |
| Platte Mountain .....            | D. & R. G. R. R. ....      | 8,417        |
| Platte Pulpit .....              | Hayden .....               | 9,343        |
| Platte Summit .....              | Hayden .....               | 8,000        |
| Platteville .....                | R. V. B. & C. R. R. ....   | 5,094        |
| Platte Junction .....            | D. P. R. R. ....           | 4,812        |
| Pleasant Valley .....            | D. & R. G. R. R. ....      | 5,385        |
| Pole Creek Mountain .....        | Wheeler .....              | 6,271        |
| Poncho .....                     | Wheeler .....              | 13,400       |
| Poncho, Maysville Junction ..... | D. & R. G. R. R. ....      | 7,458        |
| Poncho Pass .....                | D. & R. G. R. R. ....      | 7,488        |
| Ponil Pass .....                 | Wheeler .....              | 8,945        |
|                                  | Wheeler .....              | 9,848        |

| Station.                           | Authority                 | Eleva      |
|------------------------------------|---------------------------|------------|
| Post-oak Pass .....                | Palmer .....              | 7          |
| Powell, Mount .....                | Hayden .....              | 13         |
| Do ..... Timber line on .....      | Hayden .....              | 11         |
| Princeton, Mount .....             | Hayden .....              | 14         |
| Do .....                           | Wheeler .....             | 14         |
| Do ..... Timber line on .....      | Hayden .....              | 11         |
| Prospect Hill .....                | Hayden .....              | 8          |
| Prospect Peak .....                | Wheeler .....             | 9          |
| Prowers .....                      | A., T. & S. F. R. R. .... | 3          |
| Ptarmigan Peak .....               | Hayden .....              | 13         |
| Pueblo, track at depot .....       | Wheeler .....             | 4          |
| Do .....                           | A., T. & S. F. R. R. .... | 4          |
| Puncho Creek, Saw-mill .....       | Wheeler .....             | 8          |
| Pyramid Peak .....                 | Hayden .....              | 11         |
| Do .....                           | Hayden .....              | 13         |
| Quandary Peak .....                | Hayden .....              | 14         |
| Quarry .....                       | D. & R. G. R. R. ....     | 6          |
| Rabbit Ears Mountain .....         | Hayden .....              | 10         |
| Ralston Butte .....                | Hayden .....              | 10         |
| Raton Pass .....                   | Wheeler .....             | 7          |
| Raynolds, Fort .....               | Wheeler .....             | 4          |
| Recen .....                        | D. & R. G. R. R. ....     | 10         |
| Red Cliff .....                    | D. & R. G. R. R. ....     | 8          |
| Red Cloud Peak .....               | Wheeler .....             | 14         |
| Red Mountain .....                 | Wheeler .....             | 12         |
| Do .....                           | Wheeler .....             | 13         |
| Do ..... Timber line .....         | Wheeler .....             | 11         |
| Red Peak .....                     | Hayden .....              | 12         |
| Reed's Ranch .....                 | Wheeler .....             | 7          |
| Rhyolite Peak .....                | Hayden .....              | 10         |
| Rio Grande Pyramid .....           | Hayden .....              | 13         |
| Rito Alto .....                    | Wheeler .....             | 8          |
| Rito Alto, Mount .....             | Hayden .....              | 12         |
| Do .....                           | Wheeler .....             | 12         |
| Do ..... Timber line on .....      | Wheeler .....             | 11         |
| River Bend .....                   | Kans. Pac. R. R. ....     | 4          |
| Riverside .....                    | Wheeler .....             | 8          |
| Do .....                           | D. & R. G. R. R. ....     | 8          |
| Roan .....                         | D. & R. G. R. R. ....     | 4          |
| Roan or Book Plateau (crest) ..... | Hayden .....              | 8,000 to 8 |
| Robinson's .....                   | D. & R. G. R. R. ....     | 10         |
| Robinson .....                     | A., T. & S. F. R. R. .... | 3          |
| Rock Cliff Post-Office .....       | Wheeler .....             | 8          |
| Rock Creek .....                   | D. & R. G. R. R. ....     | 8          |
| Rockvale .....                     | A., T. & S. F. R. R. .... | 5          |
| Rockwood .....                     | A., T. & S. F. R. R. .... | 7          |
| Rocky Butte .....                  | Wheeler .....             | 8          |
| Rocky Ford .....                   | A., T. & S. F. R. R. .... | 4          |
| Rollinsville .....                 | Hayden .....              | 8          |
| Rosalie, Mount .....               | Hayden .....              | 14         |
| Do .....                           | Wheeler .....             | 14         |
| Rosita .....                       | Wheeler .....             | 8          |
| Rosita (sun dial) .....            | Wheeler .....             | 8          |
| Roubideau's Pass .....             | Pac. R. R. Reports .....  | 9          |
| Round Hill .....                   | D. & R. G. R. R. ....     | 8          |
| Round Mountain P. O. ....          | Wheeler .....             | 8          |
| Round Peak .....                   | Wheeler .....             | 12         |
| Rowter, Mount .....                | Ruffner .....             | 13         |
| Ryan's .....                       | D. & R. G. R. R. ....     | 9          |
| Saguache .....                     | Wheeler .....             | 7          |
| Do .....                           | Hayden .....              | 7          |
| Saint John's .....                 | Whitney .....             | 10         |
| Saint Mary's .....                 | Wheeler .....             | 6          |

| Station.                            | Authority.                | Elevation.     |
|-------------------------------------|---------------------------|----------------|
|                                     |                           | <i>Feet.</i>   |
| Saint Mary's .....                  | Hayden .....              | 6,067          |
| Saint Vrain's .....                 | Parry .....               | 5,256          |
| Salida, Gunnison Junc .....         | D. & R. G. R. R. ....     | 7,028          |
| Salt Creek .....                    | D. & R. G. R. R. ....     | 5,442          |
| Salt Works, South Park .....        | D. & S. P. R. R. ....     | 8,894          |
| Do .....                            | Whitney .....             | 9,008          |
| Do .....                            | Hayden .....              | 8,749          |
| San Carlos .....                    | D. & R. G. R. R. ....     | 4,912          |
| San Cristoval, Lake .....           | Hayden .....              | 9,000          |
| San Francisco Pass .....            | Palmer .....              | 8,560          |
| Sangre de Christo .....             | D. & R. G. R. R. ....     | 9,042          |
| Sangre de Christo Pass .....        | Wheeler .....             | 9,578          |
| Do .....                            | U. P. R. R. Surveys ..... | 9,186          |
| Do .....                            | Hayden .....              | 9,454          |
| San Isabel .....                    | Wheeler .....             | 7,537          |
| San Juan City .....                 | Wheeler .....             | 8,901          |
| San Luis de Culebra .....           | Wheeler .....             | 7,596          |
| San Luis Lake .....                 | Wheeler .....             | 7,535          |
| Do .....                            | Hayden .....              | 7,592          |
| San Luis Peak .....                 | Hayden .....              | 14,100         |
| San Luis Valley .....               | Hayden .....              | 7,000 to 8,000 |
| San Miguel Lake .....               | Hayden .....              | 9,720          |
| Santa Clara .....                   | D. & R. G. R. R. ....     | 6,180          |
| Sapinero .....                      | D. & R. G. R. R. ....     | 7,223          |
| Sargents .....                      | D. & R. G. R. R. ....     | 8,456          |
| Scrappy Butte .....                 | Hayden .....              | 8,600          |
| Sedalia .....                       | D. & R. G. R. R. ....     | 5,815          |
| Sedgwick, Fort .....                | Smithsonian Inst .....    | 3,600          |
| Serape .....                        | D. & R. G. R. R. ....     | 6,210          |
| Shale .....                         | D. & R. G. R. R. ....     | 4,575          |
| Shavano, Mount .....                | Hayden .....              | 14,239         |
| Sheep Mountain .....                | Hayden .....              | 12,589         |
| Shingled Mountain .....             | Hayden .....              | 12,072         |
| Shirley .....                       | D. & R. G. R. R. ....     | 8,654          |
| Sierra Blanca, timber line on ..... | Hayden .....              | 10,410         |
| Signal Butte .....                  | Hayden .....              | 8,900          |
| Silesia Butte .....                 | Wheeler .....             | 13,699         |
| Silla .....                         | D. & R. G. R. R. ....     | 6,650          |
| Silverheels, Mount .....            | Hayden .....              | 13,897         |
| Do .....                            | Whitney .....             | 13,832         |
| Do .....                            | Hayden .....              | 11,549         |
| Do .....                            | Timber line on .....      |                |
| Silver Plume .....                  | G. L. & S. J. R. R. ....  | 9,074          |
| Silverton .....                     | Hayden .....              | 9,400          |
| Do .....                            | D. & R. G. R. R. ....     | 9,202          |
| Simpeon, Mount .....                | Wheeler .....             | 14,055         |
| Sizer's Ranch .....                 | Wheeler .....             | 4,040          |
| Skull Creek Pass .....              | Hayden .....              | 7,797          |
| Slate Mountain .....                | Hayden .....              | 12,891         |
| Slate Ranch .....                   | Wheeler .....             | 9,257          |
| Smith Hill .....                    | Col. Cent. R. R. ....     | 7,626          |
| Smith's Peak .....                  | Hayden .....              | 13,093         |
| Sneffels, Mount .....               | Hayden .....              | 14,158         |
| Snowmass Mountain .....             | Hayden .....              | 13,970         |
| Snyder's Ranch .....                | Wheeler .....             | 8,127          |
| Soda Springs, Animas Park .....     | D. & R. G. R. R. ....     | 6,828          |
| Do .....                            | Hayden .....              | 6,853          |
| Soledad .....                       | D. & R. G. R. R. ....     | 6,355          |
| Sopris Peak .....                   | Hayden .....              | 12,823         |
| South Arkansas P. O .....           | Wheeler .....             | 7,383          |
| South Boulder Peak .....            | Hayden .....              | 8,533          |
| South Fork .....                    | D. & R. G. R. R. ....     | 8,166          |
| South Mam .....                     | Hayden .....              | 10,897         |
| South Park .....                    | Hayden .....              | 8,000-10,000   |
| South Platte .....                  | G. & S. P. R. R. ....     | 5,049          |

| Station.                          | Authority.               | Eleva |
|-----------------------------------|--------------------------|-------|
| South Platte Bridge.....          | Wheeler.....             | 7     |
| South Pueblo.....                 | D. & R. G. R. R.....     | 4     |
| Do..... Union Depot.....          | A. T. & S. F. R. R.....  | 4     |
| South River Peak.....             | Hayden.....              | 13    |
| Spanish Peaks, E.....             | Hayden.....              | 13    |
| Do..... W.....                    | Hayden.....              | 13    |
| Do..... W.....                    | Wheeler.....             | 13    |
| Spring Valley.....                | .....                    | 6     |
| Squaw.....                        | Hayden.....              | 11    |
| Starkville.....                   | A. T. & S. F. R. R.....  | 6     |
| Star Ranch.....                   | Wheeler.....             | 7     |
| Stern's Store.....                | Wheeler.....             | 9     |
| Stevens.....                      | Col. Cent. R. R.....     | 8     |
| Stevens' Mine.....                | Hayden.....              | 11    |
| Stewart's Peak.....               | Hayden.....              | 14    |
| Do.....                           | Wheeler.....             | 14    |
| Stormy Peak.....                  | Hayden.....              | 9     |
| Sugarloaf.....                    | Hayden.....              | 8     |
| Sultan Mountain.....              | Hayden.....              | 13    |
| Do.....                           | Wheeler.....             | 13    |
| Summit Mines, general level.....  | Wheeler.....             | 11    |
| Summit Peak.....                  | Hayden.....              | 13    |
| Table Mountain (north).....       | Hayden.....              | 6     |
| Do..... (south).....              | Hayden.....              | 6     |
| Tank Peak.....                    | King.....                | 8     |
| Tarryall.....                     | Whitney.....             | 10    |
| Do.....                           | Hayden.....              | 10    |
| Do.....                           | Parry.....               | 9     |
| Tarryall Pass.....                | Hayden.....              | 12    |
| Tarryall Peak.....                | Hayden.....              | 12    |
| Tempus.....                       | A. T. & S. F. R. R.....  | 4     |
| Tennessee Pass.....               | Wheeler.....             | 10    |
| Do.....                           | Hayden.....              | 10    |
| Teocalli.....                     | Hayden.....              | 13    |
| Terrible Mine.....                | Hayden.....              | 9     |
| Tétons.....                       | Wheeler.....             | 14    |
| Texas Creek.....                  | D. & R. G. R. R.....     | 6     |
| Thatcher.....                     | A. T. & S. F. R. R.....  | 5     |
| Thomas, Mount.....                | Wheeler.....             | 11    |
| Thompson's.....                   | D. & R. G. R. R.....     | 4     |
| Thompson's Park.....              | Hayden.....              | 7     |
| Three Point Block.....            | Wheeler.....             | 12    |
| Thunder Butte.....                | Hayden.....              | 9     |
| Tollgate.....                     | D. & R. G. R. R.....     | 8     |
| Tollgate, Poncho Creek Road.....  | Wheeler.....             | 8     |
| Torrey's Peak.....                | Hayden.....              | 14    |
| Do.....                           | Whitney.....             | 14    |
| Treasury Mountain.....            | Hayden.....              | 13    |
| Trinchera.....                    | D. & R. G. R. R.....     | 8     |
| Trinchera Pass.....               | K. P. R. R. surveys..... | 7     |
| Trinchera Peak.....               | Hayden.....              | 13    |
| Do.....                           | Wheeler.....             | 13    |
| Trinidad.....                     | Toner.....               | 5     |
| Do.....                           | A. T. & S. F. R. R.....  | 5     |
| Do.. (astronomical monument)..... | Wheeler.....             | 5     |
| Troublesome Peak.....             | Hayden.....              | 11    |
| Trout Creek Pass.....             | D. & S. P. R. R.....     | 9     |
| Do.....                           | Hayden.....              | 9     |
| Do.....                           | Wheeler.....             | 9     |
| Trout Lake.....                   | Wheeler.....             | 9     |
| Tumichi Dome.....                 | Hayden.....              | 11    |
| Twin Creek Pass.....              | Wheeler.....             | 8     |
| Twin Lakes.....                   | D. & R. G. R. R.....     | 9     |

| Station.                          | Authority.               | Elevation.    |
|-----------------------------------|--------------------------|---------------|
|                                   |                          | <i>Feet.</i>  |
| Twin Lakes .....                  | Hayden .....             | 9,357         |
| Tyrone .....                      | A. T. & S. F. R. R. .... | 5,518         |
| Uncompahgre .....                 | Hayden .....             | 6,400         |
| Uncompahgre Peak .....            | Wheeler .....            | 14,408        |
| Do .....                          | Hayden .....             | 14,235        |
| Uncompahgre Plateau (crest) ..... | Hayden .....             | 9,000-10,000  |
| Unagua Spring .....               | Hayden .....             | 8,141         |
| Union Cross Roads .....           | .....                    | 6,287         |
| Union Park .....                  | Wheeler .....            | 9,655         |
| Utah Line .....                   | D. & R. G. R. R. ....    | 4,725         |
| Utah Peak (El Lat6) .....         | Wheeler .....            | 10,152        |
| Do .....                          | Hayden .....             | 9,884         |
| Utah Peak (Middle Park) .....     | Hayden .....             | 11,968        |
| Vallejo .....                     | D. & R. G. R. R. ....    | 6,200         |
| Valley Station .....              | .....                    | 4,500         |
| Valle .....                       | D. & R. G. R. R. ....    | 6,513         |
| Valmont .....                     | D. & B. V. R. R. ....    | 5,172         |
| Varnum's P. O. ....               | Wheeler .....            | 7,990         |
| Vasquez Pass .....                | .....                    | 11,500        |
| Vaile's Peak .....                | Parry .....              | 13,456        |
| Venable's Ranch .....             | Wheeler .....            | 7,628         |
| Venado Peak .....                 | Hayden .....             | 12,800        |
| Vernon, Mount .....               | Parry .....              | 6,479         |
| Vesta Pass .....                  | Wheeler .....            | 9,494         |
| Vila Grove Depot .....            | D. & R. G. R. R. ....    | 7,951         |
| Vila Grove P. O. ....             | Wheeler .....            | 8,127         |
| Virginia Peak .....               | Hayden .....             | 10,600        |
| Vlean Crest .....                 | Wheeler .....            | 13,971        |
| Vagon-wheel Gap .....             | Wheeler .....            | 8,372         |
| Do .....                          | D. & R. G. R. R. ....    | 8,427         |
| Vahatoya .....                    | D. & R. G. R. R. ....    | 6,482         |
| Valsen's .....                    | D. & R. G. R. R. ....    | 6,167         |
| Valsen's Mines .....              | D. & R. G. R. R. ....    | 6,200         |
| Vashington Gulch .....            | Wheeler .....            | 10,132        |
| Vauers .....                      | D. & R. G. R. R. ....    | 4,992         |
| Veminuche Pass .....              | Hayden .....             | 10,670        |
| Vest Cliff .....                  | D. & R. G. R. R. ....    | 7,842         |
| Vest Denver .....                 | D. & R. G. R. R. ....    | 5,179         |
| Vest Elk Peak .....               | Hayden .....             | 12,920        |
| Veston's Pass .....               | Wheeler .....            | 12,109        |
| Vetterhorn .....                  | Wheeler .....            | 14,069        |
| Vhale Peak .....                  | Hayden .....             | 13,104        |
| Vheeler's .....                   | D. & R. G. R. R. ....    | 9,759         |
| White Earth Creek P. O. ....      | Wheeler .....            | 8,163         |
| Whiteface Peak .....              | Hayden .....             | 11,493        |
| Whitehead .....                   | King .....               | 10,817        |
| White River Agency .....          | Hayden .....             | 6,491         |
| White River Plateau .....         | Hayden .....             | 11,000-12,000 |
| White Rock Mountain .....         | Hayden .....             | 13,357        |
| Do .....                          | Hayden .....             | 11,919        |
| White Rancho, Huerfano Park ..... | Wheeler .....            | 7,469         |
| White Water .....                 | D. & R. G. R. R. ....    | 4,635         |
| Widfield .....                    | D. & R. G. R. R. ....    | 5,697         |
| Wigwam .....                      | D. & R. G. R. R. ....    | 5,211         |
| Wilcox Ranch, Antelope Park ..... | Wheeler .....            | 9,000         |
| Wild Flax Pass .....              | Palmer .....             | 8,900         |
| Wild Horse .....                  | Kans. Pac. R. R. ....    | 4,438         |
| Williams, Mount .....             | Hayden .....             | 11,413        |
| Willow Creek Pass .....           | Hayden .....             | 9,683         |
| Willson, Mount .....              | Hayden .....             | 14,280        |
| Do .....                          | Wheeler .....            | 14,309        |
| Willson's .....                   | Col. Cent. R. R. ....    | 7,481         |
| Wood Valley .....                 | .....                    | 5,533         |

| Station.                | Authority.                 | Elevation.   |
|-------------------------|----------------------------|--------------|
|                         |                            | <i>Feet.</i> |
| Wray .....              | R. V. & B. & C. R. R. .... | 3,519        |
| Yale, Mount.....        | Hayden .....               | 14,187       |
| Do.....                 | Whitney .....              | 14,263       |
| Do.....                 | Wheeler.....               | 14,121       |
| Yampa Peak .....        | King .....                 | 8,022        |
| Yellow Jacket Pass..... | Hayden .....               | 7,493        |
| Yellow Peak .....       | Wheeler.....               | 13,618       |
| Zenobia Peak .....      | King .....                 | 9,297        |
| Zirkel Mountain .....   | King .....                 | 12,126       |

# CONNECTICUT.

| Station.                                                   | Authority.                        | Elevation.   |
|------------------------------------------------------------|-----------------------------------|--------------|
|                                                            |                                   | <i>Feet.</i> |
| Avon .....                                                 | N. H. & Northampton R. R. . .     | 242          |
| Berlin .....                                               | N. Y., N. H. & Htfd R. R. . .     | 63           |
| Berlin, junction with Middletown R. R. . .                 | N. Y., N. H. & Htfd R. R. . .     | 64           |
| Bridgeport, bridge near R. R. depot .....                  | U. S. C. & G. S. . . . .          | 7            |
| Do.....station, junction with Housa-<br>tonic R. R. ....   | N. Y. & N. H. R. R. ....          | 9            |
| Brookfield .....                                           | Housatonic R. R. ....             | 338          |
| Canaan .....                                               | Housatonic R. R. ....             | 627          |
| Carmel Mountain.....                                       | U. S. C. & G. S. . . . .          | 739          |
| Cheahire.....                                              | N. H. & Northampton R. R. . .     | 166          |
| Congamond Lakes.....                                       | N. H. & Northampton R. R. . .     | 227          |
| East Rock .....                                            | U. S. C. & G. S. . . . .          | 362          |
| Danbury, D. & N. R. R. ....                                | Bost. & N. Y. R. R. ....          | 397          |
| Farmington.....                                            | N. H. & Northampton R. R. . .     | 204          |
| Granby .....                                               | N. H. & Northampton R. R. . .     | 204          |
| Great Rock or Rabbit Rock .....                            | U. S. C. & G. S. . . . .          | 376          |
| Hartford.....                                              | N. Y., N. H. & Htfd R. R. . .     | 39           |
| Hawleyville .....                                          | Housatonic R. R. ....             | 306          |
| Hickox .....                                               | U. S. C. & G. S. . . . .          | 651          |
| Joshua Station.....                                        | U. S. C. & G. S. . . . .          | 608          |
| Lakeville .....                                            | Conn. Western R. R. ....          | 670          |
| Meriden .....                                              | N. Y., N. H. & Htfd R. R. . .     | 131          |
| Middletown.....                                            | N. Y., N. H. & Htfd R. R. . .     | 23           |
| Mount Carmel .....                                         | N. H. & Northampton R. R. . .     | 114          |
| Mystic.....                                                | N. Y., Prov. & Boston R. R. . .   | 7            |
| New Britain .....                                          | N. Y., N. H. & Htfd R. R. . .     | 179          |
| New Hartford.....                                          | Conn. Western R. R. ....          | 389          |
| New Haven, Chapel street Bridge.....                       | U. S. C. & G. S. . . . .          | 6            |
| Do.....State street Bridge.....                            | U. S. C. & G. S. . . . .          | 11           |
| Do.....New Road.....                                       | U. S. C. & G. S. . . . .          | 34           |
| Do.....large granite post in green .....                   | U. S. C. & G. S. . . . .          | 30           |
| Do.....                                                    | N. Y., N. H. & Htfd R. R. . .     | 10           |
| Do.....Sheffield Scientific school .....                   | U. S. C. & G. S. . . . .          | 32           |
| Do.....& Shoreline Junction.....                           | N. Y., N. H. & Htfd R. R. . .     | 20           |
| Do.....Signal Station.....                                 | U. S. Signal Office .....         | 106          |
| New London .....                                           | N. Y., N. H. & Htfd R. R. . .     | 9            |
| Do.....Signal Station.....                                 | U. S. Signal Office.....          | 47           |
| New Milford .....                                          | Housatonic R. R. ....             | 224          |
| New Rochelle Junction.....                                 | N. Y., N. H. & Htfd R. R. . .     | 82           |
| Noank .....                                                | N. Y., Prov. & Boston R. R. . .   | 14           |
| Norfolk .....                                              | Conn. Western R. R. ....          | 1, 220       |
| Norwalk Station, Junction with Danbury<br>R. R. ....       | N. Y. & N. H. R. R. ....          | 25           |
| Norwich, Main St .....                                     | New London Northern R. R. . .     | 7            |
| Plainfield .....                                           | Htfd., Prov. & Fishkill R. R. . . | 162          |
| Plainville .....                                           | N. H. & Northampton R. R. . .     | 191          |
| Poquonock.....                                             | N. Y., Prov. & Boston R. R. . .   | 8            |
| Saybrook, junction with Connecticut Val-<br>ley R. R. .... | N. Y., N. H. & Htfd R. R. . .     | 24           |
| Simsbury .....                                             | N. H. & Northampton R. R. . .     | 167          |
| Southington .....                                          | N. H. & Northampton R. R. . .     | 152          |



| Station.                           | Authority.                         | Elevation.   |
|------------------------------------|------------------------------------|--------------|
|                                    |                                    | <i>Feet.</i> |
| Stamford .....                     | N. Y. & N. H. R. R. ....           | 12           |
| Thompson, E. So. Bridge R. R. .... | Bost. & N. Y. R. R. ....           | 483          |
| Vernon, Rockville Branch .....     | Bost. & N. Y. R. R. ....           | 242          |
| Waterbury .....                    | Htfd., Prov. & Fishkill R. R. .... | 260          |
| West Mystic .....                  | N. Y., Prov. & Bost. R. R. ....    | 0            |
| West Rock .....                    | U. S. C. & G. S. ....              | 405          |
| West Winsted .....                 | Conn. Western R. R. ....           | 720          |
| Willimantic .....                  | Htfd., Prov. & Fishkill R. R. .... | 233          |
| Windsor Locks .....                | N. Y., N. H. & Htfd. R. R. ....    | 40           |

# DAKOTA.

| Station.                                 | Authority.                | Elevation.   |
|------------------------------------------|---------------------------|--------------|
|                                          |                           | <i>Feet.</i> |
| Abraham Lincoln, Fort .....              |                           | 2,211        |
| Alcester .....                           | Dak. Cent. R. R. ....     | 1,355        |
| Altamont .....                           | C. N. W. R. R. ....       | 1,834        |
| Apple Creek Valley .....                 | N. P. R. R. ....          | 1,711        |
| Aurora .....                             | C. & N. W. R. R. ....     | 1,630        |
| Anstin .....                             |                           | 1,221        |
| Belfield .....                           | N. P. R. R. ....          | 2,577        |
| Bennett, Fort, Signal Station .....      | U. S. Signal Office ..... | 1,440        |
| Beresford .....                          | Dak. Cent. R. R. ....     | 1,505        |
| Berthold, Fort .....                     |                           | 1,873        |
| Big Sioux River, water 2d crossing ..... | C. M. & St. P. R. R. .... | 1,479        |
| Bismarck .....                           | N. P. R. R. ....          | 1,668        |
| Do. Signal Station .....                 | U. S. Signal Office ..... | 1,677        |
| Do. Mo. River, low water .....           | N. P. R. R. ....          | 1,616        |
| Blue Lake .....                          | Fargo & S. W. R. R. ....  | 1,965        |
| Bois des Sioux .....                     | Toner .....               | 1,039        |
| Brochel Lake .....                       | Nicollet .....            | 1,860        |
| Brookings .....                          | C. & N. W. R. R. ....     | 1,636        |
| Buford, Fort .....                       | Smithsonian Inst .....    | 2,017        |
| Do. Signal Station .....                 | U. S. Signal Office ..... | 1,876        |
| Burbank .....                            | S. C. & D. R. R. ....     | 1,153        |
| Canistota .....                          | Dak. Cent. R. R. ....     | 1,555        |
| Canova .....                             | Dak. Cent. R. R. ....     | 1,525        |
| Canton .....                             | S. C. & D. R. R. ....     | 1,291        |
| Carthage .....                           | Dak. Cent. R. R. ....     | 1,440        |
| Casselton .....                          | N. P. R. R. ....          | 930          |
| Cavour .....                             | C. & N. W. R. R. ....     | 1,311        |
| Centreville .....                        | Dak. Cent. R. R. ....     | 1,233        |
| Clark Centre .....                       | Dak. Cent. R. R. ....     | 1,785        |
| Clark, Fort .....                        | Petermann .....           | 1,827        |
| Cleveland .....                          | N. P. R. R. ....          | 1,840        |
| Coteau du Missouri .....                 |                           | 1,800-2,000  |
| Coteau des Prairies .....                |                           | 1,500-1,800  |
| Cotters Depot .....                      | Fargo & S. W. R. R. ....  | 909          |
| Crook's Tower .....                      | Jenny .....               | 7,600        |
| Davenport Depot .....                    | Fargo & S. W. R. R. ....  | 921          |
| Davis Junction .....                     | S. C. & D. R. R. ....     | 1,130        |
| Deadwood, Signal Station .....           | U. S. Signal Office ..... | 4,630        |
| De Smet .....                            | C. & N. W. R. R. ....     | 1,726        |
| Dickinson .....                          | N. P. R. R. ....          | 2,403        |
| Devil's Lake .....                       | Thomas .....              | 1,467        |
| Doland .....                             | Dak. Cent. R. R. ....     | 1,355        |
| Driscoll .....                           | N. P. R. R. ....          | 1,835        |
| Eden .....                               | S. C. & P. R. R. ....     | 1,239        |
| Egan .....                               | C. M. & St. P. R. R. .... | 1,510        |
| Elk Point .....                          | S. C. & D. R. R. ....     | 1,142        |
| Eskelon Lake (station) .....             | N. P. R. R. ....          | 1,447        |
| Eskelon Lake, water .....                | N. P. R. R. ....          | 1,432        |
| Esmond .....                             | Dak. Cent. R. R. ....     | 1,430        |
| Fairview .....                           | C. & N. W. R. R. ....     | 1,542        |
| Do .....                                 | S. C. & D. R. R. ....     | 1,231        |
| Fargo .....                              | N. P. R. R. ....          | 903          |
| Fawn Lake, water .....                   | St. P. & S. C. R. R. .... | 1,320        |
| Flandreau .....                          | C. M. & St. P. R. R. .... | 1,550        |
| Frankfort .....                          | Dak. Cent. R. R. ....     | 1,296        |
| Gary .....                               | C. & N. W. R. R. ....     | 1,484        |
| Gayville .....                           | S. C. & D. R. R. ....     | 1,178        |

| Station.                             | Authority.               | Eleva |
|--------------------------------------|--------------------------|-------|
| Gladstone.....                       | N. P. R. R.....          |       |
| Glenullin.....                       | N. P. R. R.....          |       |
| Goodwin.....                         | C. & N. W. R. R.....     |       |
| Greenwood.....                       | Smithsonian Inst.....    |       |
| Harney's Peak.....                   | Ludlow.....              |       |
| Hartford Siding.....                 | St. P. & S. C. R. R..... |       |
| Hawarden.....                        | Dak. Cent. R. R.....     |       |
| Henry.....                           | Dak. Cent. R. R.....     |       |
| Herman.....                          | C. M. & St. P. R. R..... |       |
| Herman, Lake.....                    | C. M. & St. P. R. R..... |       |
| Horace Depot.....                    | Fargo & S. W. R. R.....  |       |
| Hurley.....                          | Dak. Cent. R. R.....     |       |
| Huron.....                           | C. & N. W. R. R.....     |       |
| Huron Junction.....                  | C. & N. W. R. R.....     |       |
| Iroquois.....                        | C. & N. W. R. R.....     |       |
| Jamestown.....                       | N. P. R. R.....          |       |
| Jefferson.....                       | S. C. & D. R. R.....     |       |
| Kampeska, Lake.....                  | C. & N. W. R. R.....     |       |
| Kampeska, Lake, water.....           | C. & N. W. R. R.....     |       |
| Kamskusahkee Lake.....               | P. R. R. Reports.....    |       |
| Kranzburg.....                       | C. & N. W. R. R.....     |       |
| Little Missouri.....                 | N. P. R. R.....          |       |
| Little Missouri Buttes.....          | Jenney.....              |       |
| McCook.....                          | S. C. & D. R. R.....     |       |
| McKenzie.....                        | N. P. R. R.....          |       |
| Madison Lake.....                    | C. M. & St. P. R. R..... |       |
| Mandan.....                          | N. P. R. R.....          |       |
| Mapleton.....                        | N. P. R. R.....          |       |
| Meckling.....                        | S. C. & D. R. R.....     |       |
| Millbank Junction.....               | C. M. & St. P. R. R..... |       |
| Montrose Siding.....                 | St. P. & S. C. R. R..... |       |
| New Buffalo.....                     | N. P. R. R.....          |       |
| New Madison.....                     | C. M. & St. P. R. R..... |       |
| Noreland.....                        | C. & N. W. R. R.....     |       |
| Oakwood Settlement.....              | Nicollet.....            |       |
| Oriaka.....                          | N. P. R. R.....          |       |
| Parker.....                          | Dak. Cent. R. R.....     |       |
| Pembina, Signal Station.....         | U. S. Signal Office..... |       |
| Pierre.....                          | C. & N. W. R. R.....     |       |
| Pierre, Fort.....                    | Med. Dep't, U. S. A..... |       |
| Preston, Lake.....                   | C. & N. W. R. R.....     |       |
| Randall, Fort.....                   | Med. Dep't, U. S. A..... |       |
| Ransom, Fort.....                    | Med. Dep't, U. S. A..... |       |
| Richardson.....                      | N. P. R. R.....          |       |
| Richland.....                        |                          |       |
| Salem.....                           | St. P. & S. C. R. R..... |       |
| Sanborn.....                         | N. P. R. R.....          |       |
| Sedalia.....                         | N. P. R. R.....          |       |
| Sentinel Butte.....                  | N. R. R. R.....          |       |
| Sheyenne River.....                  | N. P. R. R.....          |       |
| Sims.....                            | N. P. R. R.....          |       |
| Sioux Falls.....                     | S. C. & D. R. R.....     |       |
| Do.....                              | C. M. & St. P. R. R..... |       |
| Do.....                              | St. P. & S. C. R. R..... |       |
| Sioux Falls Junction.....            | C. M. & St. P. R. R..... |       |
| South Heart.....                     | N. P. R. R.....          |       |
| Spiritwood.....                      | N. P. R. R.....          |       |
| Square House.....                    |                          |       |
| Steele.....                          | N. P. R. R.....          |       |
| Stevenson, Fort, Signal Station..... | U. S. Signal Office..... |       |
| Sully, Fort.....                     | U. S. Signal Office..... |       |
| Sully Spring.....                    | N. P. R. R.....          |       |
| Tappen.....                          | N. P. R. R.....          |       |

| Station.                   | Authority.                | Elevation.   |
|----------------------------|---------------------------|--------------|
|                            |                           | <i>Feet.</i> |
| Totten, Fort .....         | Thorne .....              | 1,490        |
| Union, Fort .....          | Toner .....               | 1,970        |
| Valley City .....          | N. P. R. R. ....          | 1,218        |
| Valley Springs .....       | St. P. & S. C. R. R. .... | 1,392        |
| Vermillion .....           | S. C. & D. R. R. ....     | 1,161        |
| Vilas .....                | Dak. Cent. R. R. ....     | 1,480        |
| Virginia .....             | S. C. & D. R. R. ....     | 1,221        |
| Volga .....                | C. & N. W. R. R. ....     | 1,636        |
| Wadsworth, Fort .....      |                           | 1,896        |
| Do .....                   | Smithsonian Inst .....    | 1,650        |
| Warren's Peak .....        | Jenney .....              | 6,800        |
| Watertown .....            | Dak. Cent. R. R. ....     | 1,735        |
| Wheatland .....            | N. P. R. R. ....          | 985          |
| Yankton .....              | S. C. & D. R. R. ....     | 1,196        |
| Do .. Agency .....         | Smithsonian Inst .....    | 1,800        |
| Do .. Signal Station ..... | U. S. Signal Office ..... | 1,228        |

# DELAWARE.

| Station.                                                       | Authority.                | Elevation.   |
|----------------------------------------------------------------|---------------------------|--------------|
|                                                                |                           | <i>Feet.</i> |
| Bellevue .....                                                 | P. W. & B. R. R. ....     | 14           |
| Bridgeville .....                                              | D. R. R. ....             | 55           |
| Canterbury .....                                               | D. R. R. ....             | 69           |
| Centre .....                                                   | W. & R. R. R. ....        | 263          |
| Chesapeake and Delaware Canal Crossing.                        | D. R. R. ....             | 61           |
| Claymont .....                                                 | P. W. & B. R. R. ....     | 30           |
| Clayton .....                                                  | D. R. R. ....             | 45           |
| Delaware Breakwater, Signal Station.                           | U. S. Signal Office. .... | 20           |
| Delaware City .....                                            | Pa. & Del. R. R. ....     | 16           |
| Delmar .....                                                   | E. S. R. R. ....          | 32           |
| Dover .....                                                    | D. R. R. ....             | 39           |
| Dupont's .....                                                 | W. & R. R. R. ....        | 262          |
| Georgetown .....                                               | J. & B. R. R. ....        | 52           |
| Harrington .....                                               | D. R. R. ....             | 63           |
| Holly Oak .....                                                | P. W. & B. R. R. ....     | 10           |
| Lewes .....                                                    | J. & B. R. R. ....        | 9            |
| Middletown .....                                               | D. R. R. ....             | 66           |
| Milford .....                                                  | J. & B. R. R. ....        | 15           |
| Newark .....                                                   | P. W. & B. R. R. ....     | 106          |
| Do. crossing of the Delaware R. R. ....                        | Pa. & Del. R. R. ....     | 118          |
| Newport .....                                                  | P. W. & B. R. R. ....     | 21           |
| Oak Grove .....                                                | D. & D. R. R. ....        | 97           |
| Rodney, junction with New Castle and<br>French Town R. R. .... | D. R. R. ....             | 87           |
| Ross .....                                                     | D. R. R. ....             | 42           |
| Staunton .....                                                 | P. W. & B. R. R. ....     | 17           |
| Townsend .....                                                 | D. R. R. ....             | 71           |
| Wilmington .....                                               | P. W. & B. R. R. ....     | 7            |

# DISTRICT OF COLUMBIA.

| Station.                                                            | Authority.           | Elevation.   |
|---------------------------------------------------------------------|----------------------|--------------|
|                                                                     |                      | <i>Feet.</i> |
| Capitol, dome.....                                                  | U. S. C. & G. S..... | 379.00       |
| Do...east front, ground in front of cen-<br>tral steps.....         | U. S. C. & G. S..... | 89.00        |
| Caustin, ground at Δ.....                                           | U. S. C. & G. S..... | 386.00       |
| Coast Survey Office, top of roof at flagstaff.....                  | U. S. C. & G. S..... | 137.00       |
| Do.....floor of vestibule.....                                      | U. S. C. & G. S..... | 78.00        |
| Georgetown College, observatory.....                                | U. S. C. & G. S..... | 209.00       |
| Insane Asylum, U. S., top of balustrade on<br>tower.....            | U. S. C. & G. S..... | 255.00       |
| Insane Asylum, U. S., ground at north front<br>of tower.....        | U. S. C. & G. S..... | 173.00       |
| Naval Observatory, U. S., top of small<br>dome.....                 | U. S. C. & G. S..... | 150.00       |
| Navy-yard, bridge, curbstone east end, B.<br>M. No. 2.....          | U. S. C. & G. S..... | 8.00         |
| Navy-yard, tide gauge.....                                          | U. S. C. & G. S..... | 0.27         |
| Do .... B. M.....                                                   | U. S. C. & G. S..... | 5.00         |
| Do .... platform foot of flagstaff.....                             | U. S. C. & G. S..... | 39.00        |
| Smithsonian Institution, top of balustrade<br>on highest tower..... | U. S. C. & G. S..... | 175.00       |
| Smithsonian Institution, ground north<br>front of tower.....        | U. S. C. & G. S..... | 34.00        |
| Soldiers' Home, top of old balustrade.....                          | U. S. C. & G. S..... | 410.00       |
| Do .....foot of tower, south side.....                              | U. S. C. & G. S..... | 330.00       |

# FLORIDA.

| Station.                                    | Authority.                  | Elev. |
|---------------------------------------------|-----------------------------|-------|
| Anthony Place .....                         | A. G. & W. I. T. R. R. .... |       |
| Archer .....                                | A. G. & W. I. T. R. R. .... |       |
| Arredonda .....                             | A. G. & W. I. T. R. R. .... |       |
| Baldwin Junction .....                      | A. G. & W. I. T. R. R. .... |       |
| Barton .....                                | A. G. & W. I. T. R. R. .... |       |
| Bronson .....                               | A. G. & W. I. T. R. R. .... |       |
| Callahan .....                              | A. G. & W. I. T. R. R. .... |       |
| Cedar Key .....                             | A. G. & W. I. T. R. R. .... |       |
| Do .... Signal Station .....                | U. S. Signal Office .....   |       |
| Dutton .....                                | A. G. & W. I. T. R. R. .... |       |
| Fernandina .....                            | A. G. & W. I. T. R. R. .... |       |
| Gainesville .....                           | A. G. & W. I. T. R. R. .... |       |
| Hawthorne .....                             | A. G. & W. I. T. R. R. .... |       |
| Highland, Trail Ridge, summit of R. R. .... | A. G. & W. I. T. R. R. .... |       |
| Jacksonville, Signal Station .....          | U. S. Signal Office .....   |       |
| Key West, Signal Station .....              | U. S. Signal Office .....   |       |
| Lawtey .....                                | A. G. & W. I. T. R. R. .... |       |
| Lochloosa .....                             | A. G. & W. I. T. R. R. .... |       |
| Maxville .....                              | A. G. & W. I. T. R. R. .... |       |
| Ocala .....                                 | A. G. & W. I. T. R. R. .... |       |
| Orange Lake .....                           | A. G. & W. I. T. R. R. .... |       |
| Pensacola, Signal Station .....             | U. S. Signal Office .....   |       |
| Punta Rasa, Signal Station .....            | U. S. Signal Office .....   |       |
| Rose Wood .....                             | A. G. & W. I. T. R. R. .... |       |
| Santa Fé .....                              | A. G. & W. I. T. R. R. .... |       |
| Silver Spring .....                         | A. G. & W. I. T. R. R. .... |       |
| Starke .....                                | A. G. & W. I. T. R. R. .... |       |
| Thurston .....                              | A. G. & W. I. T. R. R. .... |       |
| Waldo .....                                 | A. G. & W. I. T. R. R. .... |       |

# GEORGIA.

| Station.                                 | Authority.                | Elevation.   |
|------------------------------------------|---------------------------|--------------|
|                                          |                           | <i>Feet.</i> |
| Academy Mountain .....                   | U. S. C. & G. S. ....     | 1,136        |
| Acworth .....                            | W. & A. R. R. ....        | 926          |
| Adairville .....                         | W. & A. R. R. ....        | 710          |
| Alappeha Station .....                   | B. & A. R. R. ....        | 267          |
| Albany .....                             | S. W. R. R. ....          | 232          |
| Do .....                                 | B. & A. R. R. ....        | 168          |
| Alcova Mountain .....                    | U. S. C. & G. S. ....     | 1,090        |
| Alcovy .....                             | Ga. R. R. ....            | 721          |
| Do .. level low water in Alcovy River .. | Ga. R. R. ....            | 654          |
| Allatoona .....                          | W. & A. R. R. ....        | 878          |
| Americus .....                           | S. W. R. R. ....          | 362          |
| Andersonville .....                      | S. W. R. R. ....          | 396          |
| Autioch .....                            | Ga. R. R. ....            | 778          |
| Athens .....                             | Ga. R. R. ....            | 694          |
| Atlanta .....                            | Ga. R. R. ....            | 1,050        |
| Do .....                                 | M. & W. R. R. ....        | 1,050        |
| Do .....                                 | W. & A. R. R. ....        | 1,050        |
| Do .....                                 | A. & R. A. L. R. R. ....  | 1,050        |
| Do .. signal station .....               | U. S. Signal Office ..... | 1,131        |
| Augusta .....                            | Ga. R. R. ....            | 134          |
| Do .. signal station .....               | U. S. Signal Office ..... | 183          |
| Barnesville .....                        | M. & W. R. R. ....        | 875          |
| Barnett .....                            | Ga. R. R. ....            | 647          |
| Barton .....                             | W. & A. R. R. ....        | 845          |
| Baxley .....                             | M. & B. R. R. ....        | 210          |
| Beallwood .....                          | C. & R. R. R. ....        | 387          |
| Belair .....                             | Ga. R. R. ....            | 309          |
| Belleville .....                         | A. & R. R. R. ....        | 1,342        |
| Herzelia .....                           | Ga. R. R. ....            | 502          |
| Burts .....                              | W. & A. R. R. ....        | 750          |
| Big Shanty .....                         | W. & A. R. R. ....        | 1,100        |
| Blood Mountain .....                     | U. S. C. & G. S. ....     | 4,463        |
| Bolton .....                             | W. & A. R. R. ....        | 850          |
| Bowersville .....                        | Elberton R. R. ....       | 934          |
| Bowman .....                             | Elberton R. R. ....       | 796          |
| Brookfield .....                         | B. & A. R. R. ....        | 303          |
| Brown's Station .....                    | S. W. R. R. ....          | 371          |
| Brunswick .....                          | M. & B. R. R. ....        | 14           |
| Buckhead .....                           | Ga. R. R. ....            | 626          |
| Butord .....                             | A. & R. A. L. R. R. ....  | 1,207        |
| Bullard .....                            | M. & B. R. R. ....        | 265          |
| Buzzard's Roost .....                    | M. & B. R. R. ....        | 240          |
| Calhoun .....                            | W. & A. R. R. ....        | 657          |
| Camak .....                              | Ga. R. R. ....            | 592          |
| Camp Creek Ridge .....                   | S. W. R. R. ....          | 308          |
| Canton .....                             | M. & N. G. R. R. ....     | 894          |
| Do .. about bed of Etowah River .....    | M. & N. G. R. R. ....     | 859          |
| Capitol Tower Mountain, Atlanta .....    | U. S. C. & G. S. ....     | 1,163        |
| Carrs .....                              | Ga. R. R. ....            | 507          |
| Cartersville .....                       | W. & A. R. R. ....        | 760          |
| Cass .....                               | W. & A. R. R. ....        | 765          |
| Catania .....                            | C. & R. R. R. ....        | 692          |
| Cave Springs .....                       | S. R. & D. R. R. ....     | 672          |
| Center .....                             | N. E. R. R. ....          | 850          |
| Channey .....                            | M. & B. R. R. ....        | 303          |
| Clarkston .....                          | Ga. R. R. ....            | 1,012        |
| Clarksville C. H. ....                   | U. S. C. & G. S. ....     | 1,478        |
| Cleveland Church .....                   | U. S. C. & G. S. ....     | 1,616        |



| Station.                              | Authority.          | Elevat |
|---------------------------------------|---------------------|--------|
| Cochran .....                         | M. & B. R. R.       | J      |
| Cohutta Mountain .....                | U. S. C. & G. S.    | 4      |
| Colman's .....                        | S. W. R. R.         |        |
| Columbus .....                        | C. & R. R. R.       |        |
| Concord .....                         | R. R. surveys       |        |
| Conyers .....                         | Ga. R. R.           |        |
| Covington .....                       | Ga. R. R.           |        |
| Do level low water in Yellow River    | Ga. R. R.           |        |
| Crawfordville .....                   | Ga. R. R.           |        |
| Culloden .....                        | R. R. surveys       |        |
| Culverton .....                       | Ga. R. R.           |        |
| Cumming .....                         | U. S. C. & G. S.    | 1      |
| Currahee Mountain .....               | U. S. C. & G. S.    | 1      |
| Cuthbert Depot .....                  | S. W. R. R.         |        |
| Dademont .....                        | Ala. G. S. R. R.    |        |
| Dahlonega, Agricultural College ..... | U. S. C. & G. S.    | 1      |
| Dalton .....                          | S. R. & D. R. R.    |        |
| Davis .....                           | B. & A. R. R.       |        |
| Davisborough .....                    | C. R. R.            |        |
| Dawson .....                          | S. W. R. R.         |        |
| Dearing .....                         | Ga. R. R.           |        |
| Decatur .....                         | Ga. R. R.           | 1      |
| Deveraux .....                        | Ga. R. R.           |        |
| Dome Mountain .....                   | U. S. C. & G. S.    | 4      |
| Dormille .....                        | A. & R. A. L. R. R. | 1      |
| Dry Pond .....                        | A. & R. A. L. R. R. | 1      |
| Du Bois .....                         | M. & B. R. R.       |        |
| Duluth .....                          | A. & R. A. L. R. R. | 1      |
| East Macon .....                      | C. R. R.            |        |
| Eastman .....                         | M. & B. R. R.       |        |
| East Point .....                      | A. & W. P. R. R.    | 1      |
| Eden .....                            | C. R. R.            |        |
| Egypt .....                           | C. R. R.            |        |
| Elberton .....                        | Elberton R. R.      |        |
| Emmit .....                           | C. R. R.            |        |
| Enota Mountain .....                  | U. S. C. & G. S.    | 4      |
| Fairburn .....                        | A. & W. P. R. R.    | 1      |
| Fair Grounds .....                    | W. & A. R. R.       |        |
| Fellowship Church .....               | Elberton R. R.      |        |
| Fodder's Bald Mountain .....          | Guyot               | 4      |
| Forrest .....                         | Ga. R. R.           |        |
| Forsyth .....                         | M. & W. R. R.       |        |
| Fort Gaines Depot .....               | S. W. R. R.         |        |
| Do Bridge .....                       | S. W. R. R.         |        |
| Fortsons .....                        | C. & R. R. R.       |        |
| Fort Valley .....                     | S. W. R. R.         |        |
| Fosterville .....                     | M. & W. R. R.       |        |
| Gainesville .....                     | A. & R. A. L. R. R. | 1      |
| Gillsville .....                      | N. E. R. R.         | 1      |
| Gilmore .....                         | W. & A. R. R.       |        |
| Goodwin .....                         | A. & R. A. L. R. R. |        |
| Gordon .....                          | Cent. R. R.         |        |
| Goss Store .....                      | Elberton R. R.      |        |
| Graham .....                          | M. & B. R. R.       |        |
| Grantville .....                      | A. & W. P. R. R.    |        |
| Grassy Mountain .....                 | U. S. C. & G. S.    | 3      |
| Graysville .....                      | W. & A. R. R.       |        |
| Greensboro Depot .....                | U. S. C. & G. S.    |        |
| Do .....                              | Ga. R. R.           |        |
| Griffin .....                         | M. & W. R. R.       |        |
| Griswold .....                        | Cent. R. R.         |        |
| Guyton .....                          | Cent. R. R.         |        |
| Haddocks .....                        | Ga. R. R.           |        |
| Halcyondale .....                     | Cent. R. R.         |        |

| Station.                                  | Authority.          | Elevation.   |
|-------------------------------------------|---------------------|--------------|
|                                           |                     | <i>Feet.</i> |
| Halla .....                               | W. & A. R. R.       | 771          |
| Hamilton .....                            | C. & R. R. R.       | 786          |
| Harbers .....                             | S. R. & D. R. R.    | 648          |
| Harlem .....                              | Ga. R. R.           | 562          |
| Harmony Grove .....                       | N. E. R. R.         | 954          |
| Hawkinsville .....                        | M. & B. R. R.       | 235          |
| Hazlehurst .....                          | M. & B. R. R.       | 261          |
| Herdon .....                              | Cent. R. R.         | 174          |
| Hines .....                               | C. & R. R. R.       | 592          |
| Hogansville .....                         | A. & W. P. R. R.    | 731          |
| Holly Springs .....                       | M. & N. G. R. R.    | 1,114        |
| Hood .....                                | C. & R. R. R.       | 912          |
| Isabella .....                            | B. & A. R. R.       | 340          |
| Jesup .....                               | M. & B. R. R.       | 100          |
| Jonesboro .....                           | M. & W. R. R.       | 905          |
| Kenesaw .....                             | U. S. C. & G. S.    | 1,809        |
| Kingsboro .....                           | C. & R. R. R.       | 612          |
| Kingston .....                            | W. & A. R. R.       | 710          |
| Knoxville .....                           | R. R. surveys       | 640          |
| Lavonia .....                             | Elberton R. R.      | 865          |
| Lawrenceville .....                       | L. B. R. R.         | 1,082        |
| La Grange .....                           | A. & W. P. R. R.    | 742          |
| Lexington .....                           | Ga. R. R.           | 770          |
| Lithonia .....                            | Ga. R. R.           | 937          |
| Long Cane .....                           | A. & W. P. R. R.    | 624          |
| Lula .....                                | N. E. R. R.         | 1,334        |
| Lumber City .....                         | M. & B. R. R.       | 150          |
| McDaniels .....                           | W. & A. R. R.       | 663          |
| McDonald .....                            | Cent. R. R.         | 245          |
| McIlvors .....                            | W. & A. R. R.       | 965          |
| McPherson Barracks .....                  | U. S. C. & G. S.    | 1,078        |
| McRae .....                               | M. & B. R. R.       | 148          |
| McVie .....                               | M. & B. R. R.       | 148          |
| Macon .....                               | M. & B. R. R.       | 334          |
| Madison .....                             | Ga. R. R.           | 681          |
| Marietta .....                            | M. & N. G. R. R.    | 1,133        |
| Marshallsville .....                      | D. W. R. R.         | 493          |
| Martins .....                             | Elberton R. R.      | 917          |
| Maxeys .....                              | Ga. R. R.           | 742          |
| Mayfield .....                            | Ga. R. R.           | 402          |
| Maysville .....                           | N. E. R. R.         | 1,001        |
| Messena .....                             | Ga. R. R.           | 559          |
| Milledgeville .....                       | Ga. R. R.           | 310          |
| Millen .....                              | Cent. R. R.         | 158          |
| Millwood .....                            | B. & A. R. R.       | 130          |
| Milner .....                              | M. & W. R. R.       | 863          |
| Mona .....                                | U. S. C. & G. S.    | 5,039        |
| Morris Station .....                      | S. W. R. R.         | 244          |
| Mount Airy .....                          | A. & R. A. L. R. R. | 1,587        |
| Mud Creek Bald Mountain .....             | Guyot               | 4,705        |
| Nances .....                              | C. & R. R. R.       | 537          |
| New Holland .....                         | A. & R. A. L. R. R. | 1,182        |
| Newnan .....                              | A. & W. P. R. R.    | 959          |
| Nicholson .....                           | N. E. R. R.         | 893          |
| Noahway Bridge .....                      | S. W. R. R.         | 294          |
| Noonday Valley .....                      | M. & N. G. R. R.    | 949          |
| Norcross .....                            | A. & R. A. L. R. R. | 1,078        |
| Norwood .....                             | Ga. R. R.           | 602          |
| Oconee .....                              | Ga. R. R.           | 447          |
| Do. level low water in Oconee River ..... | Ga. R. R.           | 412          |
| Ogeechee .....                            | C. R. R.            | 106          |
| Oglethorpe .....                          | S. W. R. R.         | 301          |
| Opelika .....                             | S. W. R. R.         | 810          |

(205)

| Station.                              | Authority.               | Elevation.   |
|---------------------------------------|--------------------------|--------------|
|                                       |                          | <i>Feet.</i> |
| Palmetto.....                         | A. & W. P. R. R.....     | 1,025        |
| Paramore Hill.....                    | Cent. R. R.....          | 233          |
| Peach.....                            | U. S. C. & G. S.....     | 1,068        |
| Pearson.....                          | B. & A. R. R.....        | 175          |
| Pendarvis.....                        | M. & B. R. R.....        | 90           |
| Pine Log Mountain.....                | U. S. C. & G. S.....     | 2,340        |
| Pine Mountain.....                    | C. & R. R. R.....        | 1,052        |
| Powells.....                          | A. & W. P. R. R.....     | 987          |
| Prattville.....                       | M. & W. R. R.....        | 625          |
| Pirors.....                           | S. R. & D. R. R.....     | 819          |
| Pucketts.....                         | A. & W. P. R. R.....     | 939          |
| Rabunor, Mud Creek Bald Mountain..... | U. S. C. & G. S.....     | 4,717        |
| Red Oak.....                          | A. & W. P. R. R.....     | 1,025        |
| Reid.....                             | M. & B. R. R.....        | 281          |
| Resaca.....                           | W. & A. R. R.....        | 654          |
| Rich Hill.....                        | R. R. surveys.....       | 619          |
| Ridge.....                            | U. S. C. & G. S.....     | 1,070        |
| Ringgold.....                         | W. & A. R. R.....        | 785          |
| Rising Fawn.....                      | Ala. G. S. R. R.....     | 797          |
| Riverside.....                        | B. & A. R. R.....        | 255          |
| Rives.....                            | S. R. & D. R. R.....     | 633          |
| Roberts.....                          | Ga. R. R.....            | 542          |
| Rogers.....                           | W. & A. R.....           | 734          |
| Rome.....                             | S. R. & D. R. R.....     | 627          |
| Rough and Ready.....                  | M. & W. R. R.....        | 1,004        |
| Roystons.....                         | Elberton R. R.....       | 909          |
| Ruffs.....                            | W. & A. R. R.....        | 1,080        |
| Rutledge.....                         | Ga. R. R.....            | 725          |
| Sand Hill.....                        | M. & B. R. R.....        | 58           |
| Satilla.....                          | M. & B. R. R.....        | 159          |
| Savannah, Depot.....                  | Cent. R. R.....          | 32           |
| Do..... Signal Station.....           | U. S. Signal Office..... | 87           |
| Sawdust.....                          | Ga. R. R.....            | 536          |
| Sawnee.....                           | U. S. C. & G. S.....     | 1,967        |
| Scarborough.....                      | Cent. R. R.....          | 148          |
| Seagos.....                           | S. W. R. R.....          | 362          |
| Sebastopol.....                       | Cent. R. R.....          | 190          |
| Sewall's Cut.....                     | W. & A. R. R.....        | 1,166        |
| Sitting Bull Mountain.....            | U. S. C. & G. S.....     | 5,046        |
| Six Mile.....                         | S. R. & D. R. R.....     | 684          |
| Skitt Mountain.....                   | U. S. C. & G. S.....     | 2,076        |
| Smithville.....                       | S. W. R. R.....          | 334          |
| Smyrna.....                           | W. & A. R. R.....        | 1,069        |
| Social Circle.....                    | Ga. R. R.....            | 875          |
| South Mountain.....                   | Ga. R. R.....            | 1,040        |
| Sparta.....                           | Ga. R. R.....            | 567          |
| Spears.....                           | Cent. R. R.....          | 238          |
| Stegalls.....                         | W. & A. R. R.....        | 846          |
| Sterling.....                         | M. & B. R. R.....        | 23           |
| Stone Mountain.....                   | U. S. C. & G. S.....     | 1,686        |
| Stone Village.....                    | U. S. C. & G. S.....     | 1,037        |
| Sulphur Spring.....                   | A. & R. A. L. R. R.....  | 1,252        |
| Sulphur Springs.....                  | Ala. G. S. R. R.....     | 907          |
| Sumner.....                           | B. & A. R. R.....        | 340          |
| Surrency.....                         | M. & B. R. R.....        | 192          |
| Suwannee.....                         | L. B. R. R.....          | 1,027        |
| Sweat Mountain.....                   | U. S. C. & G. S.....     | 1,694        |
| Tallulah, S. E. Summit.....           | U. S. C. & G. S.....     | 2,849        |
| Do..... N. W. Summit.....             | U. S. C. & G. S.....     | 3,172        |
| Thomson.....                          | Ga. R. R.....            | 517          |
| Tilton.....                           | W. & A. R. R.....        | 665          |
| Toccoa.....                           | Elberton R. R.....       | 1,040        |
| Tonah Mountain.....                   | U. S. C. & G. S.....     | 3,168        |
| Tooni.....                            | M. & N. G. R. R.....     | 1,035        |

| Station.               | Authority.               | Elevation.   |
|------------------------|--------------------------|--------------|
|                        |                          | <i>Feet.</i> |
| Towns .....            | M. & B. R. R. ....       | 135          |
| Tray Mountain .....    | U. S. C. & G. S. ....    | 4,404        |
| Do .....               | Guyot .....              | 4,428        |
| Tree .....             | U. S. C. & G. S. ....    | 1,045        |
| Trenton .....          | Ala. G. S. R. R. ....    | 739          |
| Tugaloo .....          | A. & R. A. L. R. R. .... | 650          |
| Tunnel Hill .....      | W. & A. R. R. ....       | 853          |
| Union Point .....      | Ga. R. R. ....           | 658          |
| Vernon .....           | A. C. R. R. ....         | 176          |
| Vining Station .....   | W. & A. R. R. ....       | 951          |
| Walker Mountain .....  | U. S. C. & G. S. ....    | 2,593        |
| Ward's Station .....   | S. W. R. R. ....         | 394          |
| Waresboro' .....       | B. & A. R. R. ....       | 117          |
| Warrenton .....        | Ga. R. R. ....           | 506          |
| Way Cross .....        | B. & A. R. R. ....       | 100          |
| West Bowersville ..... | Elberton R. R. ....      | 916          |
| West Point .....       | A. & W. P. R. R. ....    | 584          |
| Whitfield .....        | A. & W. P. R. R. ....    | 757          |
| Willacoochee .....     | B. & A. R. R. ....       | 220          |
| Winchester .....       | S. W. R. R. ....         | 465          |
| Winters .....          | Ga. R. R. ....           | 800          |
| Woodstock .....        | M. & N. G. R. R. ....    | 987          |
| Woodville .....        | Ga. R. R. ....           | 707          |
| Yonah .....            | U. S. C. & G. S. ....    | 3,167        |

# IDAHO.

| Station.                                | Authority.                  | Elevation.             |
|-----------------------------------------|-----------------------------|------------------------|
|                                         |                             | <i>Feet.</i>           |
| Algoma .....                            | N. P. R. R .....            | 2, 214                 |
| American Falls .....                    | Wheeler .....               | 4, 457                 |
| Anderson's .....                        | Wheeler .....               | 4, 492                 |
| Antelope Peak .....                     | Wheeler .....               | 7, 222                 |
| Ariomo .....                            | U. & N. R. R .....          | 4, 659                 |
| Badger Peak .....                       | Wheeler .....               | 6, 359                 |
| Bannock Peak .....                      | Wheeler .....               | 8, 359                 |
| Battle Creek .....                      | U. & N. R. R .....          | 4, 500                 |
| Bear Lake .....                         | Wheeler .....               | 5, 960                 |
| Bear River Bridge .....                 | Hayden .....                | 5, 744                 |
| Beaver Cañon Stage Station .....        | Pre. R. R. levels .....     | 5, 925                 |
| Beer Springs .....                      | Hayden .....                | 5, 529                 |
| Do .....                                | Lander .....                | 5, 850                 |
| Bennington .....                        | Hayden .....                | 5, 708                 |
| Do .....                                | Wheeler .....               | 6, 132                 |
| Big Butte .....                         | Wheeler .....               | 7, 659                 |
| Blackfoot .....                         | U. & N. R. R .....          | 4, 515                 |
| Blackfoot Fork, Bridge .....            | Hayden .....                | 4, 456                 |
| Blackfoot Peak .....                    | Hayden .....                | 7, 490                 |
| Blackfoot Stage Station .....           | Wheeler .....               | 4, 447                 |
| Black Pine Mountain .....               | Wheeler .....               | 9, 336                 |
| Black Rock Stage Station .....          | Wheeler .....               | 4, 539                 |
| Bloomington .....                       | Wheeler .....               | 6, 076                 |
| Do .....                                | Hayden .....                | 5, 985                 |
| Bloomington Peak .....                  | Wheeler .....               | 9, 354                 |
| Boisé City, Signal Station .....        | U. S. Signal Office .....   | 2, 768                 |
| Boisé, Fort .....                       |                             | 1, 998                 |
| Cache Peak .....                        | Wheeler .....               | 10, 451                |
| Camas Creek Ranch .....                 | Hayden .....                | 4, 722                 |
| Caribou Mountain .....                  | Hayden .....                | 9, 854                 |
| Carpenter's Station .....               | Hayden .....                | 4, 666                 |
| Castle Rock .....                       | Wheeler .....               | 9, 610                 |
| Cedar Peak .....                        | Wheeler .....               | 7, 587                 |
| Chilco .....                            | N. P. R. R .....            | 2, 450                 |
| Citadel Peak .....                      | King .....                  | 6, 700                 |
| Clarkston .....                         | Wheeler .....               | 4, 853                 |
| Clifton .....                           | Wheeler .....               | 4, 926                 |
| Do .....                                | Hayden .....                | 4, 693                 |
| Coeur d'Aléne Lake .....                | Mullan .....                | 2, 150                 |
| Do .....                                | Pacific R. R. Reports ..... | 2, 240                 |
| Coeur d'Aléne Mission .....             | Pacific R. R. Reports ..... | 2, 230                 |
| Crater Buttes, mouth Henry's Fork ..... | Hayden .....                | E. 5, 638<br>W. 5, 425 |
| Curlew .....                            | Wheeler .....               | 4, 397                 |
| Deep Creek Mountain .....               | Wheeler .....               | 8, 818                 |
| Desert Wells .....                      | Hayden .....                | 4, 816                 |
| Devil's Corral .....                    | Wheeler .....               | 3, 601                 |
| Dry Creek Station .....                 | Hayden .....                | 5, 689                 |
| Eagle Peak .....                        | Mullan .....                | 7, 500                 |
| Eagle Rock .....                        | U. & N. R. R .....          | 4, 723                 |
| Eagle Rock, Signal Station .....        | U. S. Signal Office .....   | 4, 781                 |
| East Malade Mountain .....              | Hayden .....                | 9, 332                 |
| Elkhorn Mail Station .....              | Wheeler .....               | 4, 998                 |
| Elkhorn Village .....                   | Wheeler .....               | 4, 950                 |
| Emigrant Springs .....                  | Wheeler .....               | 5, 271                 |
| Fish Haven .....                        | Wheeler .....               | 5, 963                 |
| Do .....                                | Hayden .....                | 5, 932                 |
| Florence .....                          |                             | 8, 000                 |

| Station.                                          | Authority.        | Elevation.   |
|---------------------------------------------------|-------------------|--------------|
|                                                   |                   | <i>Feet.</i> |
| Fly Spring.....                                   | Wheeler.....      | 5,912        |
| Fountain Peak (north side).....                   | Wheeler.....      | 8,900        |
| Fountain Spring.....                              | Wheeler.....      | 5,235        |
| Franklin.....                                     | U. & N. R. R..... | 4,513        |
| Do.....                                           | Wheeler.....      | 4,585        |
| Do.....                                           | Hayden.....       | 4,516        |
| Garfield, Mount.....                              | Hayden.....       | 9,704        |
| Georgetown.....                                   | Wheeler.....      | 6,019        |
| Do.....                                           | Hayden.....       | 5,800        |
| Georgetown Peak.....                              | Hayden.....       | 8,466        |
| Granite.....                                      | N. P. R. R.....   | 2,290        |
| Hall, Fort (10 feet below adjutant's office)..... | Wheeler.....      | 4,752        |
| Do.....                                           | Hayden.....       | 4,754        |
| Hall, Fort (old).....                             |                   | 4,500        |
| Hall.....                                         | De Lacy.....      | 4,996        |
| Harkness's Toll Gate.....                         | Wheeler.....      | 4,802        |
| Henry's Lake.....                                 | Hayden.....       | 6,443        |
| Higham's Ranch.....                               | Hayden.....       | 4,601        |
| Hitching's Ranch.....                             | Wheeler.....      | 5,205        |
| Junction Station.....                             | Hayden.....       | 6,329        |
| Kalispelm, Lake.....                              | Toner.....        | 2,093        |
| Keenam City.....                                  | Wheeler.....      | 6,641        |
| Keeney's Stage Station.....                       | Hayden.....       | 4,933        |
| Lane's Butte.....                                 | Wheeler.....      | 7,823        |
| Lane's Ranch, Marsh Lake.....                     | Wheeler.....      | 4,323        |
| Liberty.....                                      | Hayden.....       | 6,060        |
| Do.....                                           | Wheeler.....      | 6,105        |
| Lone Cone.....                                    | Hayden.....       | 9,246        |
| McCrae's Ranch.....                               | Wheeler.....      | 4,331        |
| Malade City.....                                  | Hayden.....       | 4,700        |
| Do.....                                           | Wheeler.....      | 4,663        |
| Malade Divide.....                                | Hayden.....       | 5,690        |
| Malade Spring.....                                | Wheeler.....      | 5,150        |
| Market Lake.....                                  | U. & N. R. R..... | 4,792        |
| Do.....                                           | Hayden.....       | 4,795        |
| Marsh Cone.....                                   | Hayden.....       | 7,663        |
| Meade Peak.....                                   | Wheeler.....      | 10,541       |
| Montpelier.....                                   | Hayden.....       | 5,793        |
| Montpelier (co-operative store).....              | Wheeler.....      | 5,936        |
| Mormon Salt Works.....                            | Wheeler.....      | 6,598        |
| Morristown.....                                   | Wheeler.....      | 5,716        |
| Do.....                                           | Hayden.....       | 5,700        |
| Mound Spring Station.....                         |                   | 4,429        |
| Mule Spring, head of Gentile Valley.....          | Wheeler.....      | 5,245        |
| Newton.....                                       | Hayden.....       | 4,500        |
| Nine Mile.....                                    | U. & N. R. R..... | 4,756        |
| North Soda Peak.....                              | Hayden.....       | 9,413        |
| Oneida.....                                       | Hayden.....       | 5,700        |
| Oneida Salt Works.....                            | Wheeler.....      | 6,341        |
| Do.....                                           | Hayden.....       | 6,300        |
| Ovid.....                                         | Wheeler.....      | 6,022        |
| Oxford.....                                       | U. & N. R. R..... | 4,774        |
| Do.....                                           | Hayden.....       | 4,862        |
| Do.....                                           | Wheeler.....      | 4,866        |
| Oxford, Mount.....                                | Wheeler.....      | 9,386        |
| Packer's Bridge.....                              | Hayden.....       | 4,500        |
| Paris.....                                        | Wheeler.....      | 6,018        |
| Paris Peak.....                                   | Hayden.....       | 9,522        |
| Pend d'Oreille, Lake.....                         | Petermann.....    | 2,093        |
| Do.....                                           | N. P. R. R.....   | 2,059        |
| Pillar Butte.....                                 | Wheeler.....      | 5,301        |
| Plagah, or Caribou, Mount.....                    | Wheeler.....      | 9,695        |
| Pleasant Valley Station.....                      | Hayden.....       | 6,086        |

| Station.                                 | Authority.                     | Elevation.   |
|------------------------------------------|--------------------------------|--------------|
|                                          |                                | <i>Feet.</i> |
| Pocatello .....                          | U. & N. R. R. ....             | 4,495        |
| Do....Stage Station .....                | Hayden .....                   | 4,512        |
| Do....Stage Station .....                | Wheeler .....                  | 4,620        |
| Portage .....                            | Wheeler .....                  | 4,700        |
| Port Neuf .....                          | U. & N. R. R. ....             | 4,514        |
| Prescott .....                           | N. P. R. R. ....               | 2,210        |
| Preuss, Mount .....                      | Hayden .....                   | 9,979        |
| Putnam, Mount .....                      | Wheeler .....                  | 8,905        |
| Do .....                                 | Hayden .....                   | 8,933        |
| Raft River Range .....                   | King .....                     | 7,000        |
| Raft River Stage Station .....           | Wheeler .....                  | 5,041        |
| Red Rock Gap .....                       | Hayden (railroad levels) ..... | 4,792        |
| Red Rock Ranch .....                     | Hayden .....                   | 4,792        |
| Rice's Ferry, Snake River .....          | Wheeler .....                  | 4,192        |
| Rice's Ranch .....                       | Wheeler .....                  | 4,723        |
| Richardson's .....                       | Wheeler .....                  | 5,268        |
| Richmond .....                           | Wheeler .....                  | 4,656        |
| Ross Fork Indian Agency .....            | Hayden .....                   | 4,394        |
| Do .....                                 | Wheeler .....                  | 4,545        |
| Ross Fork Station .....                  | U. & N. R. R. ....             | 4,561        |
| Saint Charles .....                      | Hayden .....                   | 5,932        |
| Saint George .....                       | Hayden .....                   | 5,771        |
| Salmon City .....                        | De Lacy .....                  | 4,030        |
| Samaria .....                            | Wheeler .....                  | 4,561        |
| Do .....                                 | Hayden .....                   | 4,800        |
| Sandpoint .....                          | N. P. R. R. ....               | 2,100        |
| Sand Ridge .....                         | U. & N. R. R. ....             | 4,723        |
| Sawtelle's Peak .....                    | Hayden .....                   | 10,013       |
| Sedgwick Peak .....                      | Wheeler .....                  | 9,207        |
| Shadow Lake .....                        | Wheeler .....                  | 4,310        |
| Sherman, Mount .....                     | Wheeler .....                  | 9,572        |
| Shoshone .....                           | U. & N. R. R. ....             | 4,587        |
| SNAKE RIVER PLAINS .....                 |                                | 4,000-4,500  |
| Snow Mountain .....                      | Hayden .....                   | 9,269        |
| Soda Peak .....                          | Hayden .....                   | 9,683        |
| Soda Springs .....                       | Hayden .....                   | 5,779        |
| Do .....                                 | Wheeler .....                  | 5,778        |
| Sohon Pass .....                         | Mullan .....                   | 5,100        |
| Stahn's Ranch .....                      | Wheeler .....                  | 4,403        |
| Do .....                                 | Wheeler .....                  | 6,067        |
| Stevens, Mount .....                     | Petermann .....                | 7,400        |
| Stevenson's Junction, Lemhi Valley ..... | De Lacy .....                  | 6,084        |
| Stoner's Station .....                   |                                | 4,621        |
| Sublette .....                           | Wheeler .....                  | 5,155        |
| Swan Lake .....                          | U. & N. R. R. ....             | 4,794        |
| Switzer's Ranch .....                    | Wheeler .....                  | 4,509        |
| Taylor's Bridge .....                    | Hayden .....                   | 4,627        |
| Ten-mile Spring .....                    | Wheeler .....                  | 5,548        |
| Toponce Ranch .....                      | Wheeler .....                  | 5,073        |
| West Malade, Mount .....                 | Hayden .....                   | 9,220        |
| Weston .....                             | Wheeler .....                  | 5,011        |
| Wiesner, Mount .....                     | Mullan .....                   | 6,000        |

# ILLINOIS.

| Station.                                        | Authority.                    | Elevation.   |
|-------------------------------------------------|-------------------------------|--------------|
|                                                 |                               | <i>Feet.</i> |
| Addieville .....                                | St. L. & S. E. R. R. ....     | 467          |
| Allendale .....                                 | C. & V. R. R. ....            | 464          |
| Altamont (crs'ng) St. L., V., T. H. & I. R. R.) | O. & M. R. R. ....            | 616          |
| Alton .....                                     | C. & A. R. R. ....            | 470          |
| Amboy .....                                     | Ill. Cent. R. R. ....         | 733          |
| America .....                                   | C. & V. R. R. ....            | 344          |
| Antioch .....                                   | I., D. & S. R. R. ....        | 661          |
| Antioch (geodetic station) .....                | U. S. Lake Survey .....       | 861          |
| Arcola .....                                    | Ill. Cent. R. R. ....         | 674          |
| Abby .....                                      | St. L. & S. E. R. R. ....     | 554          |
| Ash Grove (geodetic station) .....              | U. S. Lake Survey .....       | 666          |
| Ashkum .....                                    | Ill. Cent. R. R. ....         | 660          |
| Ashland .....                                   | O. & M. R. R. ....            | 625          |
| Ashley .....                                    | Ill. Cent. R. R. ....         | 549          |
| Atlanta .....                                   | C. & A. R. R. ....            | 744          |
| Atwater (or Zanesville) .....                   | J. S. E. R. R. ....           | 652          |
| Atwood .....                                    | I., D. & S. R. R. ....        | 669          |
| Auburn .....                                    | C. & A. R. R. ....            | 666          |
| Aurora .....                                    | C., B. & Q. R. R. ....        | 649          |
| Badgley .....                                   | St. L. & S. E. R. R. ....     | 536          |
| Baland (3½ miles east of Omaha) .....           | O. & M. R. R. ....            | 458          |
| Bardstown, (crossing R., R. I. & St. L. R. R.)  | O. & M. R. R. ....            | 435          |
| Barnett .....                                   | J. S. E. R. R. ....           | 672          |
| Barnhill (valley of Watson's Creek) .....       | O. & M. R. R. ....            | 385          |
| Barry .....                                     | H. & N. R. R. ....            | 670          |
| Bartley .....                                   | O. & M. R. R. ....            | 386          |
| Bayliss .....                                   | H. & N. R. R. ....            | 869          |
| Beardstown (surface of Illinois River) .....    | Mich. & Ill. Canal .....      | 423          |
| Beaucoup .....                                  | St. L. & S. E. R. R. ....     | 538          |
| Beecher .....                                   | O. & M. R. R. ....            | 610          |
| Belle Air (geodetic station) .....              | U. S. Lake Survey .....       | 588          |
| Belleville .....                                | B. & S. Ill. R. R. ....       | 479          |
| Benton .....                                    | B. & E. R. R. ....            | 485          |
| Benton (geodetic station) .....                 | U. S. Lake Survey .....       | 595          |
| Berhany .....                                   | P., D. & E. R. R. ....        | 665          |
| Big Rattlesnake .....                           | C. & St. L. R. R. ....        | 405          |
| Birkner .....                                   | St. L. & S. E. R. R. ....     | 499          |
| Birkner (summit) .....                          | St. L. & S. E. R. R. ....     | 568          |
| Birkner (surface ground) .....                  | St. L. & S. E. R. R. ....     | 583          |
| Blandinsville .....                             | T., P. & W. R. R. ....        | 730          |
| Bloom .....                                     | J. & N. Ind. R. R. ....       | 688          |
| Bloomfield (summit) .....                       | C. & V. R. R. ....            | 405          |
| Bloomfield (surface ground) .....               | C. & V. R. R. ....            | 430          |
| Bloomington .....                               | Ill. Cent. R. R. ....         | 823          |
| Bluff City .....                                | St. L., V. & T. H. R. R. .... | 505          |
| Braceville .....                                | C. & A. R. R. ....            | 603          |
| Bradford .....                                  | O. & M. R. R. ....            | 581          |
| Breeds .....                                    | T., P. & W. R. R. ....        | 491          |
| Brighton .....                                  | C. & A. R. R. ....            | 694          |
| Broadwell .....                                 | C. & A. R. R. ....            | 611          |
| Buda .....                                      | C. B. & Q. R. R. ....         | 768          |
| Bureau Junction .....                           | P. K. & P. R. R. ....         | 455          |
| Burnside .....                                  | T. P. & W. R. R. ....         | 638          |
| Bushnell .....                                  | C. B. & Q. R. R. ....         | 664          |
| Butler, Geodetic Station .....                  | U. S. Lake Survey .....       | 787          |
| Cahoka .....                                    | C. & St. L. R. R. ....        | 425          |
| Cairo .....                                     | Ill. Cent. R. R. ....         | 322          |
| Do. Ohio River, high water .....                | C. & V. R. R. ....            | 320          |



| Station.                                                                 | Authority.                   | Elevat |
|--------------------------------------------------------------------------|------------------------------|--------|
| Cairo Ohio River, low water.....                                         | .....                        | 1      |
| Do....railroad track on Commercial<br>ave.....                           | .....                        |        |
| Do....Signal Station.....                                                | U. S. Signal Office.....     |        |
| Caledonia.....                                                           | C. & V. R. R.....            |        |
| Calumet.....                                                             | Ill. Cent. R. R.....         |        |
| Camargo.....                                                             | I. D. & S. R. R.....         |        |
| Cambridge.....                                                           | P. & R. I. R. R.....         |        |
| Camp Point (T. W. & W. Junction).....                                    | C. B. & Q. R. R.....         |        |
| Canton.....                                                              | T. P. & W. R. R.....         |        |
| Carbondale.....                                                          | Ill. Cent. R. R.....         |        |
| Carlinville.....                                                         | C. & A. R. R.....            |        |
| Carlyle, station ledge under window of E.<br>face of C. H. B. M. on..... | U. S. C. & G. S.....         |        |
| Carlyle.....                                                             | O. & M. R. R.....            |        |
| Carmi.....                                                               | St. L. & S. E. R. R.....     |        |
| Carthage.....                                                            | C. B. & Q. R. R.....         |        |
| Casey.....                                                               | St. L., V. & T. H. R. R..... |        |
| Casey, Geodetic Station.....                                             | U. S. Lake Survey.....       |        |
| Caseyville.....                                                          | St. L., V. & T. H. R. R..... |        |
| Casner.....                                                              | I. D. & S. R. R.....         |        |
| Cayuga.....                                                              | C. & A. R. R.....            |        |
| Centerville.....                                                         | Ill. & St. L. R. R.....      |        |
| Centralia.....                                                           | Ill. Cent. R. R.....         |        |
| Champaign.....                                                           | Ill. Cent. R. R.....         |        |
| Do....Signal Station.....                                                | U. S. Signal Office.....     |        |
| Chatham.....                                                             | C. & A. R. R.....            |        |
| Chatsworth.....                                                          | T. P. & W. R. R.....         |        |
| Chenoa.....                                                              | T. P. & W. R. R.....         |        |
| Cherry Point.....                                                        | I. D. & S. R. R.....         |        |
| Chicago, city base.....                                                  | U. S. Lake Survey.....       |        |
| Do....C. & N. W. R. R. Station.....                                      | City Engineer.....           |        |
| Do....N. Ind. L. S. & M. S., and C. R.<br>I. & P. R. R. Station.....     | City Engineer.....           |        |
| Do....P. F. W. and A. & St. L. R. R.<br>Station.....                     | City Engineer.....           |        |
| Do....Ill. Cent. & Mich. Cent. R. R.<br>Station.....                     | City Engineer.....           |        |
| Do....Signal Station.....                                                | U. S. Signal Office.....     |        |
| Chrisman.....                                                            | I. D. & S. R. R.....         |        |
| Cisne.....                                                               | O. & M. R. R.....            |        |
| Claremont, Geodetic Station.....                                         | U. S. Lake Survey.....       |        |
| Clifton.....                                                             | Ill. Cent. R. R.....         |        |
| Do. Geodetic Station.....                                                | U. S. Lake Survey.....       |        |
| Clinton.....                                                             | Ill. Cent. R. R.....         |        |
| Coles.....                                                               | P. D. & E. R. R.....         |        |
| Collinsville.....                                                        | St. L., V. & T. H. R. R..... |        |
| Do....plank road.....                                                    | St. L., V. & T. H. R. R..... |        |
| Coulterville.....                                                        | B. & S. Ill. R. R.....       |        |
| Crete, Geodetic Station.....                                             | U. S. Lake Survey.....       |        |
| Cuba.....                                                                | T. P. & W. R. R.....         |        |
| Cumberland.....                                                          | St. L., V. & T. H. R. R..... |        |
| Cypress Junction.....                                                    | O. & M. R. R.....            |        |
| Cypress Pond.....                                                        | C. & V. R. R.....            |        |
| Dahlgren.....                                                            | St. L. & S. E. R. R.....     |        |
| Dalton.....                                                              | C. & E. Ill. R. R.....       |        |
| Danville.....                                                            | W. St. L. & P. R. R.....     |        |
| Do....Junction.....                                                      | C. & E. Ill. R. R.....       |        |
| Decatur.....                                                             | Ill. Cent. R. R.....         |        |
| Delafield.....                                                           | St. L. & S. E. R. R.....     |        |
| Denver, Geodetic Station.....                                            | U. S. Lake Survey.....       |        |
| Disco.....                                                               | T. P. & W. R. R.....         |        |
| Dixon.....                                                               | Ill. Cent. R. R.....         |        |
| Drivers.....                                                             | St. L. & S. E. R. R.....     |        |

| Station.                                                                                        | Authority.                                                      | Elevation.   |
|-------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|--------------|
|                                                                                                 |                                                                 | <i>Feet.</i> |
| Duquoin .....                                                                                   | B. & S. Ill. R. R. ....                                         | 459          |
| Do .....                                                                                        | B. & E. R. R. ....                                              | 475          |
| Dwight .....                                                                                    | P. K. & P. R. R. ....                                           | 609          |
| Dyke .....                                                                                      | Ill. & St. L. R. R. ....                                        | 369          |
| East Saint Louis, Relay House .....                                                             | City engineer, based on height<br>of Saint Louis directrix .... | 418          |
| Do.....large bronze plate in<br>south face east land<br>pier of Great Bridge,<br>B. M. on ..... | U. S. C. & G. S. ....                                           | 416          |
| Edgewood .....                                                                                  | Ill. Cent. R. R. ....                                           | 572          |
| Edwards .....                                                                                   | C. B. & Q. R. R. ....                                           | 650          |
| Effingham .....                                                                                 | Ill. Cent. R. R. ....                                           | 588          |
| Eldorado .....                                                                                  | C. & V. R. R. ....                                              | 384          |
| Elgin, crossing of R. R. ....                                                                   | Mich. & Ill. Canal ....                                         | 700          |
| Elkhart .....                                                                                   | C. & A. R. R. ....                                              | 617          |
| Elmwood .....                                                                                   | C. B. & Q. R. R. ....                                           | 621          |
| El Paso .....                                                                                   | Ill. Cent. R. R. ....                                           | 742          |
| Elvaston .....                                                                                  | T. P. & W. R. R. ....                                           | 663          |
| Elwood .....                                                                                    | C. & A. R. R. ....                                              | 660          |
| Enfield, junction S. & S. E. R. R. ....                                                         | St. L. & S. E. R. R. ....                                       | 458          |
| Do old town .....                                                                               | O. & M. R. R. ....                                              | 463          |
| Englewood .....                                                                                 | L. S. & M. S. R. R. ....                                        | 604          |
| Wington .....                                                                                   | St. L., V. & T. H. R. R. ....                                   | 569          |
| Do... (surface) .....                                                                           |                                                                 | 574          |
| airburg .....                                                                                   | T. P. & W. R. R. ....                                           | 697          |
| airfield .....                                                                                  | O. & M. R. R. ....                                              | 538          |
| airmount, Geodetic Station .....                                                                | U. S. Lake Survey ....                                          | 704          |
| airmingdale .....                                                                               | O. & M. R. R. ....                                              | 583          |
| arina .....                                                                                     | Ill. Cent. R. R. ....                                           | 571          |
| orris .....                                                                                     | T. P. & W. R. R. ....                                           | 677          |
| on .....                                                                                        | O. & M. R. R. ....                                              | 495          |
| on, front basement window south-east<br>corner public school building, B. M. on ..              | U. S. C. & G. S. ....                                           | 491          |
| oston .....                                                                                     | C. & I. R. R. ....                                              | 941          |
| rest .....                                                                                      | T. P. & W. R. R. ....                                           | 678          |
| ountain Bluff .....                                                                             | D. & S. W. R. R. ....                                           | 349          |
| ankfort .....                                                                                   | J. & N. Ind. R. R. ....                                         | 755          |
| anklin .....                                                                                    | J. S. E. R. R. ....                                             | 696          |
| eburg .....                                                                                     | B. & S. Ill. R. R. ....                                         | 514          |
| eport .....                                                                                     | Ill. Cent. R. R. ....                                           | 759          |
| ench Village .....                                                                              | St. L. & S. E. R. R. ....                                       | 441          |
| Do..... (surface ground) .....                                                                  |                                                                 | 437          |
| nnington .....                                                                                  | St. L., V. & T. H. R. R. ....                                   | 595          |
| nk's Grove .....                                                                                | C. & A. R. R. ....                                              | 730          |
| lena .....                                                                                      | Ill. Cent. R. R. ....                                           | 601          |
| lesburg .....                                                                                   | C. B. & Q. R. R. ....                                           | 788          |
| lva .....                                                                                       | C. B. & Q. R. R. ....                                           | 851          |
| lden, Geodetic Station .....                                                                    | U. S. Lake Survey ....                                          | 800          |
| rdner .....                                                                                     | C. & A. R. R. ....                                              | 605          |
| lman .....                                                                                      | Ill. Cent. R. R. ....                                           | 652          |
| lmore .....                                                                                     | O. & M. R. R. ....                                              | 573          |
| lson .....                                                                                      | C. B. & Q. R. R. ....                                           | 690          |
| rand .....                                                                                      | J. S. E. R. R. ....                                             | 687          |
| asford .....                                                                                    | T. P. & W. R. R. ....                                           | 605          |
| odfrey .....                                                                                    | C. & A. R. R. ....                                              | 635          |
| ood Hope .....                                                                                  | T. P. & W. R. R. ....                                           | 705          |
| oodson .....                                                                                    | I. D. & S. R. R. ....                                           | 670          |
| rand Tower .....                                                                                | D. & S. W. R. R. ....                                           | 352          |
| rant, Geodetic Station .....                                                                    | U. S. Lake Survey ....                                          | 716          |
| rayville .....                                                                                  | C. & V. R. R. ....                                              | 393          |
| reenup .....                                                                                    | St. L., V. & T. H. R. R. ....                                   | 351          |
| reenville .....                                                                                 | St. L., V. & T. H. R. R. ....                                   | 555          |

| Station.                                                                   | Authority.               | Eleva |
|----------------------------------------------------------------------------|--------------------------|-------|
| Gridley .....                                                              | T. P. & W. R. R.         |       |
| Griggsville .....                                                          | H. & N. R. R.            |       |
| Groveland Park .....                                                       | Ill. & St. L. R. R.      |       |
| Guerpert's Pass .....                                                      | C. & St. L. R. R.        |       |
| Hadley .....                                                               | H. & N. R. R.            |       |
| Hammond .....                                                              | I. D. & S. R. R.         |       |
| Hampton .....                                                              | P. D. & E. R. R.         |       |
| Harmony .....                                                              | Ill. & S. L. R. R.       |       |
| Harrisburg .....                                                           | C. & V. R. R.            |       |
| Havana .....                                                               | P. P. & J. R. R.         |       |
| Hawthorne .....                                                            | St. L. & S. E. R. R.     |       |
| Hennepin .....                                                             | P. K. & P. R. R.         |       |
| Hervey City .....                                                          | P. D. & E. R. R.         |       |
| Highland .....                                                             | St. L., V. & T. H. R. R. |       |
| Do... (surface) .....                                                      | St. L., V. & T. H. R. R. |       |
| Hinckley .....                                                             | C. & I. R. R.            |       |
| Holidays .....                                                             | O. & M. R. R.            |       |
| Hollis .....                                                               | T. P. & W. R. R.         |       |
| Hoopestown .....                                                           | C. & E. Ill. R. R.       |       |
| Howard's Point .....                                                       | St. L., V. & T. H. R. R. |       |
| Hull's Crossing Q. A. & St. L. R. R. ....                                  | H. & N. R. R.            |       |
| Hume .....                                                                 | I. D. & S. R. R.         |       |
| Hunt City, Geodetic Station .....                                          | U. S. Lake Survey        |       |
| Indian Creek Valley .....                                                  | O. & M. R. R.            |       |
| Indian Lake, water .....                                                   | St. L., V. & T. H. R. R. |       |
| Do... railroad station .....                                               | St. L., V. & T. H. R. R. |       |
| Iowa .....                                                                 | T. P. & W. R. R.         |       |
| Jacksonville .....                                                         | J. S. E. R. R.           |       |
| Joliet .....                                                               | C. & A. R. R.            |       |
| Do... Des Moines River .....                                               | Mich. & Ill. Canal       |       |
| Jonesboro .....                                                            | Ill. Cent. R. R.         |       |
| Kankakee .....                                                             | Ill. Cent. R. R.         |       |
| Do... Geodetic Station .....                                               | U. S. Lake Survey        |       |
| Kansas, Geodetic Station .....                                             | U. S. Lake Survey        |       |
| Keithsburgh .....                                                          | C. B. & Q. R. R.         |       |
| Keithsburgh Junction .....                                                 | C. B. & Q. R. R.         |       |
| Kensington .....                                                           | M. C. R. R.              |       |
| Kinderhook .....                                                           | H. & N. R. R.            |       |
| Kingston (B. & O. R. R. shops) .....                                       | B. P. & C. R. R.         |       |
| Knoxville .....                                                            | C. B. & Q. R. R.         |       |
| La Harpe .....                                                             | T. P. & W. R.            |       |
| Lake .....                                                                 | St. L., V. & T. H. R. R. |       |
| Lakewood .....                                                             | O. & M. R. R.            |       |
| La Place .....                                                             | I. D. & S. R. R.         |       |
| Larkinsburg .....                                                          | O. & M. R. R.            |       |
| La Salle .....                                                             | Ill. Cent. R. R.         |       |
| Do... surface of Illinois River .....                                      | Mich. & Ill. Canal       |       |
| Lawrenceville .....                                                        | D. & S. W. R. R.         |       |
| Laws .....                                                                 | Ill. & St. L. R. R.      |       |
| Lebanon—sill of basement window east face<br>public school, B. M. on ..... | U. S. C. & G. S.         |       |
| Lebanon .....                                                              | O. & M. R. R.            |       |
| Lena .....                                                                 | Ill. Cent. R. R.         |       |
| Leoville .....                                                             | T. P. & W. R. R.         |       |
| Lexington .....                                                            | C. & A. R. R.            |       |
| Lincoln .....                                                              | C. & A. R. R.            |       |
| Litchfield .....                                                           | J. S. E. R. R.           |       |
| Loda .....                                                                 | Ill. Cent. R. R.         |       |
| Long Creek .....                                                           | I. D. & S. R. R.         |       |
| Losant .....                                                               | P. K. & P. R. R.         |       |
| Louisville .....                                                           | O. & M. R. R.            |       |
| Lowder .....                                                               | J. S. E. R. R.           |       |
| Lowndale .....                                                             | C. & A. R. R.            |       |
| Ludlow .....                                                               | Ill. Cent. R. R.         |       |

| Station.                                                     | Authority.                    | Elevation.   |
|--------------------------------------------------------------|-------------------------------|--------------|
|                                                              |                               | <i>Feet.</i> |
| Lynn Grove, Geodetic Station .....                           | U. S. Lake Survey .....       | 772          |
| McLean .....                                                 | C. & A. R. R. ....            | 730          |
| McLeansboro .....                                            | St. L. & S. E. R. R. ....     | 500          |
| Macon .....                                                  | Ill. Cent. R. R. ....         | 716          |
| McVey .....                                                  | J. S. E. R. R. ....           | 666          |
| Manteno, Geodetic Station .....                              | U. S. Lake Survey .....       | 711          |
| Mapleton .....                                               | T. P. & W. R. R. ....         | 463          |
| Maquon .....                                                 | C., B. & Q. R. R. ....        | 630          |
| Marshall .....                                               | D. & S. W. R. R. ....         | 619          |
| Martinsville, Geodetic Station .....                         | U. S. Lake Survey .....       | 678          |
| Do .....                                                     | St. L., V. & T. H. R. R. .... | 573          |
| Marysville .....                                             | H. & N. R. R. ....            | 728          |
| Mascoutah .....                                              | St. L. & S. E. R. R. ....     | 425          |
| Mattison .....                                               | Ill. Cent. R. R. ....         | 699          |
| Mattoon .....                                                | Ill. Cent. R. R. ....         | 733          |
| Mayview, Geodetic Station .....                              | U. S. Lake Survey .....       | 706          |
| Meadows .....                                                | T. P. & W. R. R. ....         | 764          |
| Mendota .....                                                | Ill. Cent. R. R. ....         | 749          |
| Metcalf .....                                                | I. D. & S. R. R. ....         | 618          |
| Michigan City, Geodetic Station .....                        | U. S. Lake Survey .....       | 730          |
| Michigan Lake, surface of .....                              | P., Ft. W. & C. E. R. ....    | 582          |
| Millersville .....                                           | O. & M. R. R. ....            | 642          |
| Mill Shoals .....                                            | O. & M. R. R. ....            | 324          |
| Moccasin Station .....                                       | O. & M. R. R. ....            | 606          |
| Monmouth .....                                               | P. K. & P. R. R. ....         | 625          |
| Monroe .....                                                 | Ill. Cent. R. R. ....         | 796          |
| Morgan Park, Geodetic Station .....                          | U. S. Lake Survey .....       | 666          |
| Moser Station .....                                          | St. L. & S. E. R. R. ....     | 473          |
| Mound City .....                                             | C. & V. R. R. ....            | 323          |
| Do..... surface ground .....                                 |                               | 318          |
| Mound, Geodetic Station .....                                | U. S. Lake Survey .....       | 522          |
| Mounds .....                                                 | Ill. Cent. R. R. ....         | 346          |
| Mount Carbon .....                                           | D. & S. W. R. R. ....         | 372          |
| Mount Morris .....                                           | C. & I. R. R. ....            | 906          |
| Mount Vernon .....                                           | St. L. & S. E. R. R. ....     | 506          |
| Mount Zion .....                                             | P. D. & E. R. R. ....         | 694          |
| Murdock .....                                                | I. D. & S. R. R. ....         | 639          |
| Murphysboro .....                                            | C. & St. L. R. R. ....        | 425          |
| Maple .....                                                  | H. & N. R. R. ....            | 438          |
| Do surface of Illinois River at crossing<br>of railroad..... | Mich. & Ill. Canal.....       | 418          |
| Mahville .....                                               | St. L. & S. E. R. R. ....     | 503          |
| Mason .....                                                  | P. D. & E. R. R. ....         | 657          |
| Mathews .....                                                | B. & S. Ill. R. R. ....       | 404          |
| Mathews .....                                                | C. B. & Q. R. R. ....         | 573          |
| Mathews .....                                                | I. D. & S. R. R. ....         | 641          |
| Mathews .....                                                | St. L. & S. E. R. R. ....     | 411          |
| Mathews .....                                                | T. P. & W. R. R. ....         | 664          |
| Mathews .....                                                | H. & N. R. R. ....            | 778          |
| Mathews .....                                                | C. & V. R. R. ....            | 420          |
| Do..... crossing C. & V. R. R. ....                          | O. & M. R. R. ....            | 424          |
| Mathews .....                                                | C. B. & Q. R. R. ....         | 597          |
| Mathews .....                                                | U. S. Lake Survey .....       | 693          |
| Mathews .....                                                | Ill. Cent. R. R. ....         | 585          |
| Mathews .....                                                | U. S. Lake Survey .....       | 505          |
| Mathews .....                                                | C. & A. R. R. ....            | 691          |
| Mathews .....                                                | C. & A. R. R. ....            | 726          |
| Mathews .....                                                | U. S. C. & G. S. ....         | 529          |
| Mathews .....                                                | Ill. Cent. R. R. ....         | 525          |
| Mathews .....                                                | O. & M. R. R. ....            | 545          |
| Mathews .....                                                | St. L. & S. E. R. R. ....     | 450          |
| Mathews .....                                                | U. S. C. & G. S. ....         | 487          |

| Station.                                                               | Authority.                    | Elevation.  |
|------------------------------------------------------------------------|-------------------------------|-------------|
|                                                                        |                               | <i>Fet.</i> |
| Olney, near southeast corner of grounds of public school at B. M. .... | U. S. C. & G. S. ....         | 482         |
| Olney .....                                                            | O. & M. R. R. ....            | 480         |
| Omaha .....                                                            | O. & M. R. R. ....            | 369         |
| Onion Hill, Geodetic Station .....                                     | U. S. Lake Survey .....       | 569         |
| Opdyke .....                                                           | St. L. & S. E. R. R. ....     | 509         |
| Oregon .....                                                           | C. & I. R. R. ....            | 704         |
| Orion .....                                                            | P. & R. I. R. R. ....         | 751         |
| Orland, Geodetic Station .....                                         | U. S. Lake Survey .....       | 768         |
| Ottawa .....                                                           | C. B. & Q. R. R. ....         | 486         |
| Do. surface of Illinois River at mouth of Fox River .....              | Mich. & Ill. Canal .....      | 448         |
| Owaneco .....                                                          | O. & M. R. R. ....            | 616         |
| Palermo, Geodetic Station .....                                        | U. S. Lake Survey .....       | 742         |
| Pana .....                                                             | Ill. Cent. R. R. ....         | 676         |
| Paris .....                                                            | D. & S. W. R. R. ....         | 705         |
| Parkersburg, Geodetic Station .....                                    | U. S. Lake Survey .....       | 569         |
| Paxton, Geodetic Station .....                                         | U. S. Lake Survey .....       | 804         |
| Pekin .....                                                            | P. P. & J. R. R. ....         | 475         |
| Peoria .....                                                           | T. P. & W. R. R. ....         | 463         |
| Do. Adams Street Depot .....                                           | C. R. I. & P. R. R. ....      | 458         |
| Do. surface of Illinois River .....                                    | Mich. & Ill. Canal .....      | 433         |
| Pern, surface of Illinois River .....                                  | Mich. & Ill. Canal .....      | 439         |
| Philadelphia .....                                                     | O. & M. R. R. ....            | 616         |
| Philips Ferry .....                                                    | H. & N. R. R. ....            | 439         |
| Pilot Grove, Geodetic Station .....                                    | U. S. Lake Survey .....       | 780         |
| Pinckneyville .....                                                    | B. & S. Ill. R. R. ....       | 444         |
| Pisgah .....                                                           | J. S. E. R. R. ....           | 687         |
| Plateau .....                                                          | St. L., V. & T. H. R. R. .... | 568         |
| Pleasant Plains .....                                                  | O. & M. R. R. ....            | 606         |
| Pleasantville .....                                                    | St. L., V. & T. H. R. R. .... | 585         |
| Pocahontas .....                                                       | St. L., V. & T. H. R. R. .... | 498         |
| Polo .....                                                             | Ill. Cent. R. R. ....         | 849         |
| Pontiac .....                                                          | C. & A. R. R. ....            | 668         |
| Princeville .....                                                      | P. & R. I. R. R. ....         | 719         |
| Prospect .....                                                         | J. S. E. R. R. ....           | 685         |
| Queen's Lake, railroad track .....                                     | St. L. & S. E. R. R. ....     | 406         |
| Do. .... high water .....                                              | St. L. & S. E. R. R. ....     | 401         |
| Do. .... bed .....                                                     | St. L. & S. E. R. R. ....     | 379         |
| Quincy .....                                                           | C. B. & Q. R. R. ....         | 484         |
| Rantoul, Geodetic Station .....                                        | U. S. Lake Survey .....       | 821         |
| Redbud .....                                                           | C. & St. L. R. R. ....        | 457         |
| Richland .....                                                         | O. & M. R. R. ....            | 605         |
| Ridge Farm .....                                                       | D. & S. W. R. R. ....         | 685         |
| Ridgway .....                                                          | O. & M. R. R. ....            | 379         |
| Rinard .....                                                           | O. & M. R. R. ....            | 457         |
| Roaches .....                                                          | St. L. & S. E. R. R. ....     | 498         |
| Robinson .....                                                         | D. & S. W. R. R. ....         | 508         |
| Rochelle .....                                                         | C. & I. R. R. ....            | 807         |
| Rochester .....                                                        | O. & M. R. R. ....            | 569         |
| Rock Island .....                                                      | C. R. I. & P. R. R. ....      | 584         |
| Do .....                                                               | R. R. I. & St. L. R. R. ....  | 583         |
| Rushville .....                                                        | C. B. & Q. R. R. ....         | 676         |
| Sacramento, Bear Creek Valley .....                                    | O. & M. R. R. ....            | 413         |
| Saint Anne, I. C. & L. R. R. ....                                      | C. & E. Ill. R. R. ....       | 659         |
| Do. .... Geodetic Station .....                                        | U. S. Lake Survey .....       | 676         |
| Saint Francisville .....                                               | C. & V. R. R. ....            | 458         |
| Saint Jacobs .....                                                     | St. L., V. & T. H. R. R. .... | 605         |
| Salem .....                                                            | O. & M. R. R. ....            | 538         |
| Do. center of crossing southwest corner of C. H., B. M. on .....       | U. S. C. & G. S. ....         | 546         |
| Saline City, railroad track .....                                      | C. & V. R. R. ....            | 409         |
| Sanburn, railroad track .....                                          | C. & V. R. R. ....            | 609         |
| Sandoval .....                                                         | Ill. Cent. R. R. ....         | 494         |



| Station.                               | Authority.                    | Elevation.   |
|----------------------------------------|-------------------------------|--------------|
|                                        |                               | <i>Feet.</i> |
| Williamsville .....                    | C. & A. R. R. ....            | 627          |
| Willow Springs, Geodetic Station ..... | U. S. Lake Survey .....       | 729          |
| Wilmington .....                       | C. & A. R. R. ....            | 561          |
| Woodbury .....                         | St. L., V. & T. H. R. R. .... | 559          |
| Woodlawn .....                         | St. L. & S. E. R. R. ....     | 495          |
| Woodlyn .....                          | J. S. E. R. R. ....           | 701          |
| Yates City .....                       | C. B. & Q. R. R. ....         | 673          |
| York .....                             | Ill. & St. L. R. R. ....      | 524          |

# INDIANA.

| Station.                                                 | Authority.                     | Elevation. |
|----------------------------------------------------------|--------------------------------|------------|
| Acton .....                                              | C., I., St. L. & C. R. R. .... | 792        |
| Adams .....                                              | C., I., St. L. & C. R. R. .... | 880        |
| Do.. ground, intersection with Pitts-<br>burg road ..... | C., R. & Ft. W. R. R. ....     | 796        |
| Adamsboro .....                                          | Eel R. R. R. ....              | 665        |
| Albion .....                                             | B., P. & C. R. R. ....         | 927        |
| Alexandria .....                                         | L. E. & W. R. R. ....          | 857        |
| Do... L. H. & W. Crossing .....                          | C., W. & M. R. R. ....         | 872        |
| Ambia .....                                              | L. E. & W. R. R. ....          | 710        |
| Amboy .....                                              | Pan Handle R. R. ....          | 810        |
| Amity .....                                              | J., M. & I. R. R. ....         | 693        |
| Amo .....                                                | T. H. & Inds. R. R. ....       | 820        |
| Anderson .....                                           | C., C., C. & I. R. R. ....     | 880        |
| Do... Crossing .....                                     | C., C., C. & I. R. R. ....     | 894        |
| Do... P., C. & St. L. Crossing .....                     | C., W. & M. R. R. ....         | 900        |
| Do... C., C., C. & I. Junction .....                     | C., W. & M. R. R. ....         | 894        |
| Angola .....                                             | Ft. W., J. & S. R. R. ....     | 1,052      |
| Anoka Junction .....                                     | Pan Handle R. R. ....          | 696        |
| Arcola .....                                             | P., Ft. W. & C. R. R. ....     | 833        |
| Arta .....                                               | I., B. & W. R. R. ....         | 1,190      |
| Atherton .....                                           | E., T. H. & C. R. R. ....      | 522        |
| Attica .....                                             | W., St. L. & P. R. R. ....     | 540        |
| Do... ..                                                 | T., W. & W. R. R. ....         | 556        |
| Do.. bed of Wabash River .....                           | T., W. & W. R. R. ....         | 516        |
| Auburn .....                                             | Ft. W., J. & S. R. R. ....     | 872        |
| Do.. Junction .....                                      | Ft. W., J. & S. R. R. ....     | 868        |
| Aurora .....                                             | O. & M. R. R. ....             | 493        |
| Austin .....                                             | J., M. & I. R. R. ....         | 549        |
| Avilla .....                                             | G., R. & Ind. R. R. ....       | 969        |
| Do.. Summit .....                                        | B., P. & C. R. R. ....         | 1,015      |
| Baileytown .....                                         | L. S. & M. S. R. R. ....       | 635        |
| Bainbridge .....                                         | L., N. A. & C. R. R. ....      | 936        |
| Barnard .....                                            | I., D. & S. R. R. ....         | 902        |
| Batesville .....                                         | C., I., St. L. & C. R. R. .... | 968        |
| Baton .....                                              | Ft. W., M. & C. R. R. ....     | 921        |
| Becknell .....                                           | Inds. & V. R. R. ....          | 485        |
| Bedford .....                                            | L., N. A. & C. R. R. ....      | 679        |
| Beesons .....                                            | Ft. W., M. & C. R. R. ....     | 875        |
| Belknap .....                                            | St. L. & S. E. R. R. ....      | 456        |
| Belt Crossing .....                                      | J., M. & I. R. R. ....         | 716        |
| Bentonville .....                                        | J., M. & I. R. R. ....         | 1,056      |
| Bethany .....                                            | I., D. & S. R. R. ....         | 748        |
| Bloomington .....                                        | I., D. & S. R. R. ....         | 642        |
| Bloomingsport .....                                      | I., B. & W. R. R. ....         | 1,225      |
| Bloomington .....                                        | L., N. A. & C. R. R. ....      | 742        |
| Blooms .....                                             | L. E. & W. R. R. ....          | 933        |
| Blue River .....                                         | I., B. & W. R. R. ....         | 980        |
| Bluffton .....                                           | Ft. W., M. & C. R. R. ....     | 837        |
| Boonville .....                                          | L. E. E., & S. W. R. R. ....   | 391        |
| Boswell .....                                            | L. E. & W. R. R. ....          | 734        |
| Bowser .....                                             | Ft. W., M. & C. R. R. ....     | 939        |
| Boyleston .....                                          | L. E. & W. R. R. ....          | 896        |
| Brandywine .....                                         | I., B. & W. R. R. ....         | 905        |
| Brasil .....                                             | T. H. & Inds. R. R. ....       | 643        |
| Bridgeport .....                                         | T. H. & Inds. R. R. ....       | 748        |
| Brightwood .....                                         | C., C., C. & I. R. R. ....     | 791        |
| Brimfield .....                                          | L. S. & M. S. R. R. ....       | 945        |
| Bristol .....                                            | L. S. & M. S. R. R. ....       | 786        |
| Brooklyn .....                                           | Inds. & V. R. R. ....          | 659        |



| Station.                                  | Authority.                  | Elevat |
|-------------------------------------------|-----------------------------|--------|
| Brownsville.....                          | C., H. & D. R. R.....       | J      |
| Bruceville.....                           | Inds. & V. R. R.....        |        |
| Bunker Hill.....                          | Pan Handle R. R.....        |        |
| Burnettsville.....                        | T., P. & W. R. R.....       |        |
| Butler.....                               | L. S. & M. S. R. R.....     |        |
| Butlers.....                              | J., M. & I. R. R.....       |        |
| Cambridge City.....                       | J., M. & I. R. R.....       |        |
| Campbells.....                            | Inds. & V. R. R.....        |        |
| Carney's.....                             | J., M. & I. R. R.....       |        |
| Cassville.....                            | Pan Handle R. R.....        |        |
| Cedar Creek.....                          | Eel R. R. R.....            |        |
| Centerton.....                            | Inds. & V. R. R.....        |        |
| Chalmers.....                             | L., N. A. & C. R. R.....    |        |
| Chandler.....                             | L. E., E. & S. W. R. R..... |        |
| Charlestown.....                          | O. & M. R. R.....           |        |
| Chase.....                                | L. E. & W. R. R.....        |        |
| Chesterfield.....                         | C., C., C. & I. R. R.....   |        |
| Chestertown.....                          | L. S. & M. S. R. R.....     |        |
| Chestnut Ridge.....                       | J., M. & I. R. R.....       |        |
| Chili.....                                | Eel R. R.....               |        |
| Churubusco.....                           | Eel R. R.....               |        |
| Circleville.....                          | L. E. & W. R. R.....        |        |
| Clarksburgh.....                          | T. H. & Inds. R. R.....     |        |
| Clarks Hill.....                          | Inds. & La. F. R. R.....    |        |
| Clay City.....                            | T. H. & S. E. R. R.....     |        |
| Claypool.....                             | C., W. & M. R. R.....       |        |
| Clayton.....                              | T. H. & Inds. R. R.....     |        |
| Clifford.....                             | J., M. & I. R. R.....       |        |
| Clinton.....                              | E., T. H. & C. R. R.....    |        |
| Do. high water in Wabash River.....       | E., T. H. & C. R. R.....    |        |
| Do. low water in Wabash River.....        | E., T. H. & C. R. R.....    |        |
| Cloverdale.....                           | L., N. A. & C. R. R.....    |        |
| Cloverland.....                           | T. H. & Inds. R. R.....     |        |
| Coal City.....                            | T. H. & S. E. R. R.....     |        |
| Coatsville.....                           | T. H. & Inds. R. R.....     |        |
| Cochran.....                              | O. & M. R. R.....           |        |
| Coldwater, M. & G. R. R. Crossing.....    | Peninsula R. R.....         |        |
| Colfax, crossing C., L. & S. W. R. R..... | Inds. & La. F. R. R.....    |        |
| Collamer.....                             | Eel R. R.....               |        |
| Collins.....                              | Eel R. R.....               |        |
| Columbia City.....                        | P., Ft. W. & C. R. R.....   |        |
| Columbus.....                             | J., M. & I. R. R.....       |        |
| Do. . . branch on White River.....        | J., M. & I. R. R.....       |        |
| Connersville.....                         | C., H. & D. R. R.....       |        |
| Converse.....                             | Pan Handle R. R.....        |        |
| Corunna.....                              | L. S. & M. S. R. R.....     |        |
| Cory.....                                 | T. H. & S. E. R. R.....     |        |
| Crawfordsville.....                       | L., N. A. & C. R. R.....    |        |
| Crothersville.....                        | J., M. & I. R. R.....       |        |
| Crown Point Station.....                  | Pan Handle R. R.....        |        |
| Curveton.....                             | T., P. & W. R. R.....       |        |
| Daleville.....                            | C., C., C. & I. R. R.....   |        |
| Dana.....                                 | I. D. & S. R. R.....        |        |
| Danville.....                             | T., W. & W. R. R.....       |        |
| Do. . . bed of Vermillion River.....      | T., W. & W. R. R.....       |        |
| Do. . . Junction.....                     | E., T. H. & C. R. R.....    |        |
| Dayton.....                               | L. E. & W. R. R.....        |        |
| Decatur, opposite Station House.....      | C. R. & Ft. W. R. R.....    |        |
| De Forest.....                            | L. E., E. & S. W. R. R..... |        |
| Dixon.....                                | Inds. & V. R. R.....        |        |
| Duck Creek.....                           | I., B. & W. R. R.....       | 1      |
| Dunlaps.....                              | L. S. & M. S. R. R.....     |        |
| Dupont.....                               | J., M. & I. R. R.....       |        |

| Station.                                 | Authority.                    | Elevation.   |
|------------------------------------------|-------------------------------|--------------|
|                                          |                               | <i>Feet.</i> |
| Duval.....                               | I., B. & W. R. R.....         | 885          |
| Dyer.....                                | J. & M. Ind. R. R.....        | 635          |
| Early.....                               | E., T. H. & C. R. R.....      | 497          |
| Edinburgh.....                           | J., M. & I. R. R.....         | 674          |
| Edwardsport.....                         | Inds. & V. R. R.....          | 460          |
| Elizabethtown.....                       | J., M. & I. R. R.....         | 646          |
| Elkhart.....                             | L. S. & M. S. R. R.....       | 755          |
| Do.....                                  | C., W. & M. R. R.....         | 741          |
| Ellettsville.....                        | L., N. A. & C. R. R.....      | 682          |
| Ellis Mills.....                         | Inds. & V. R. R.....          | 554          |
| Ellsworth.....                           | E., T. H. & C. R. R.....      | 489          |
| Elwood.....                              | L., E. & W. R. R.....         | 858          |
| Engles.....                              | T. H. & Inds. R. R.....       | 677          |
| English Lake, Kankakee River.....        | P., Ft. W. & C. R. R.....     | 663          |
| Engene.....                              | E., T. H. & C. R. R.....      | 507          |
| Evansville.....                          | L. E., E. & S. W. R.....      | 378          |
| Do..... low water of the Ohio River..... | W. & E. Canal.....            | 326          |
| Fairland.....                            | C., I., St. L. & C. R. R..... | 774          |
| Fairmount.....                           | C., W. & M. R. R.....         | 893          |
| Falmouth.....                            | J., M. & I. R. R.....         | 1,048        |
| Farmers.....                             | Inds. & V. R. R.....          | 528          |
| Farmland.....                            | C., C., C. & I. R. R.....     | 1,037        |
| Fergusons.....                           | Ft. W., M. & C. R. R.....     | 806          |
| Fillmore.....                            | T. H. & Inds. R. R.....       | 844          |
| Five Mile.....                           | J., M. & I. R. R.....         | 465          |
| Flat Rock.....                           | J., M. & I. R. R.....         | 695          |
| Foresters.....                           | L., S. & M. S. R. R.....      | 852          |
| Fortville.....                           | C., C., C. & I. R. R.....     | 857          |
| Fort Wayne.....                          | G. R. & Ind. R. R.....        | 752          |
| Do..... city datum.....                  | City Engineer.....            | 702          |
| Do..... in front of passenger depot..... | P., Ft. W. & C. R. R.....     | 775          |
| Frankfort.....                           | L. E. & W. R. R.....          | 841          |
| Franklin.....                            | J., M. & I. R. R.....         | 732          |
| Do..... Martinsville R. R. crossing..... | J., M. & I. R. R.....         | 736          |
| Freedom.....                             | Inds. & V. R. R.....          | 538          |
| Fremont.....                             | Ft. W., J. & S. R. R.....     | 1,055        |
| Do..... Geodetic Station.....            | U. S. Lake Survey.....        | 1,142        |
| French.....                              | I., D. & S. R. R.....         | 500          |
| Friendswood.....                         | Inds. & V. R. R.....          | 738          |
| Furnessville.....                        | M. C. R. R.....               | 669          |
| Galea, Geodetic Station.....             | U. S. Lake Survey.....        | 958          |
| Gallaudet.....                           | C., I., St. L. & C. R. R..... | 852          |
| Garrett City.....                        | B., P. & C. R. R.....         | 892          |
| Garvin.....                              | L. E., E. & S. W. R. R.....   | 378          |
| Geibhard's Station.....                  | Pan Handle R. R.....          | 762          |
| Geasle.....                              | E., T. H. & C. R. R.....      | 616          |
| Gibbons.....                             | M. C. R. R.....               | 600          |
| Gillman.....                             | L. E. & W. R. R.....          | 852          |
| Gings.....                               | J., M. & I. R. R.....         | 1,000        |
| Goldsmith.....                           | L. E. & W. R. R.....          | 903          |
| Goodland.....                            | T., P. & W. R. R.....         | 718          |
| Gooschen.....                            | L. S. & M. S. R. R.....       | 789          |
| Goosport.....                            | Inds. & V. R. R.....          | 595          |
| Gravel Pit.....                          | C., C., C. & I. R. R.....     | 679          |
| Greencastle.....                         | T. H. & Inds. R. R.....       | 834          |
| Do..... Junction.....                    | L., N. A. & C. R. R.....      | 773          |
| Green Fork.....                          | I., B. & W. R. R.....         | 1,120        |
| Greensburgh.....                         | C., I., St. L. & C. R. R..... | 942          |
| Greenville Creek.....                    | I., B. & W. R. R.....         | 1,165        |
| Greenwood.....                           | Ft. W., M. & C. R. R.....     | 858          |
| Guilford.....                            | C., I., St. L. & C. R. R..... | 508          |
| Gulton.....                              | I., D. & S. R. R.....         | 630          |
| Guadram.....                             | Pan Handle R. R.....          | 710          |

| Station.                                                        | Authority.                     | Elevation.   |
|-----------------------------------------------------------------|--------------------------------|--------------|
|                                                                 |                                | <i>Feet.</i> |
| Hamlet .....                                                    | P., Ft. W. & C. R. R. ....     | 693          |
| Hamricks .....                                                  | T. H. & Inds. R. R. ....       | 703          |
| Harmans .....                                                   | C., I., St. L. & C. R. R. .... | 747          |
| Harmony .....                                                   | T. H. & Inds. R. R. ....       | 672          |
| Harrodsburgh .....                                              | L., N. A. & C. R. R. ....      | 506          |
| Harristown .....                                                | L., N. A. & D. R. R. ....      | 572          |
| Harrisville .....                                               | C., C. C. & I. R. R. ....      | 1, 101       |
| Harford City .....                                              | Ft. W., M. & C. R. R. ....     | 895          |
| Hart's Crossing .....                                           | L. E., E. & S. W. R. R. ....   | 457          |
| Hastings .....                                                  | Inds. & V. R. R. ....          | 607          |
| Hebron .....                                                    | Pan Handle R. R. ....          | 714          |
| Henryville .....                                                | J., M. & I. R. R. ....         | 479          |
| Hillsburgh .....                                                | L. E. & W. R. R. ....          | 910          |
| Hillsdale .....                                                 | I., D., & S. R. R. ....        | 452          |
| Hobart .....                                                    | P., Ft. W. & C. R. R. ....     | 623          |
| Hobbs .....                                                     | L. E. & W. R. R. ....          | 867          |
| Holmesville .....                                               | L. S. & M. S. R. R. ....       | 800          |
| Homer .....                                                     | J., M. & I. R. R. ....         | 913          |
| Hubbells .....                                                  | T. H. & S. E. R. R. ....       | 517          |
| Huntertown .....                                                | G. R. & Inds. R. R. ....       | 827          |
| Huntington .....                                                | T. W. & W. R. R. ....          | 734          |
| Do .... Court House Square .....                                | W. & E. Canal. ....            | 741          |
| Hynds .....                                                     | Inds. & V. R. R. ....          | 600          |
| Idaville .....                                                  | T. P. & W. R. R. ....          | 712          |
| Indianapolis, city datum .....                                  | City Engineer .....            | 676          |
| Do .... Belt R. R. Crossing .....                               | J. M. & I. R. R. ....          | 722          |
| Do .... Signal Station .....                                    | U. S. Signal Office .....      | 753          |
| Do .... Union Depot .....                                       | C., C., C. & I. R. R. ....     | 709          |
| Jamesboro .....                                                 | C., W. & M. R. R. ....         | 872          |
| Jefferson .....                                                 | L. E. & W. R. R. ....          | 823          |
| Do ... Geodetic Station .....                                   | U. S. Lake Survey .....        | 970          |
| Do ... Junction .....                                           | J., M. & I. R. R. ....         | 450          |
| Jeffersonville .....                                            | O. & M. R. R. ....             | 455          |
| Jonesboro .....                                                 | Pan Handle R. R. ....          | 846          |
| Jonesville .....                                                | J., M. & I. R. R. ....         | 594          |
| Kankakee .....                                                  | P. R. & P. R. R. ....          | 622          |
| Do ... Bridge .....                                             | B. P. & C. R. R. ....          | 700          |
| Kempton .....                                                   | L. E. & W. R. R. ....          | 920          |
| Kendallville .....                                              | L. S., M. S. R. R. ....        | 974          |
| Kennard .....                                                   | I., B. & W. R. R. ....         | 1, 067       |
| Kent Station .....                                              | T., P. & W. R. R. ....         | 681          |
| Keystone .....                                                  | Ft. W., M. & C. R. R. ....     | 871          |
| Kingsbury .....                                                 | Peninsula R. R. ....           | 742          |
| King's Store .....                                              | L. E. E. & S. W. R. R. ....    | 378          |
| Koutts .....                                                    | Pan Handle R. R. ....          | 628          |
| La Crosse .....                                                 | Pan Handle R. R. ....          | 675          |
| La Fayette .....                                                | T., W. & W. R. R. ....         | 595          |
| La Grange .....                                                 | G. R. & Ind. R. R. ....        | 915          |
| La Gro .....                                                    | T., W. & W. R. R. ....         | 698          |
| Lake .....                                                      | M. C. R. R. ....               | 617          |
| Lake Cicott .....                                               | T. P. & W. R. R. ....          | 703          |
| Lake Station .....                                              | J. & N. Ind. R. R. ....        | 613          |
| Laketon .....                                                   | Eel R. R. R. ....              | 762          |
| Langdons .....                                                  | J., M. & I. R. R. ....         | 539          |
| La Porte .....                                                  | L., S. & M. S. R. R. ....      | 811          |
| Lawrence .....                                                  | C., C., C. & I. R. R. ....     | 872          |
| Lawrenceburgh .....                                             | O. & M. R. R. ....             | 479          |
| Do .... bench-mark on water table<br>of the court-house front.. | U. S. C. & G. S. ....          | 467          |
| Leatherwood .....                                               | I., D. & S. R. R. ....         | 572          |
| Lebanon .....                                                   | Inds. & La. F. R. R. ....      | 925          |
| Leonard .....                                                   | I., B. & W. R. R. ....         | 1, 135       |
| Lewis Creek .....                                               | J., M. & I. R. R. ....         | 713          |

| Station.                                                                       | Authority.                     | Elevation.   |
|--------------------------------------------------------------------------------|--------------------------------|--------------|
|                                                                                |                                | <i>Fect.</i> |
| Lexington .....                                                                | O. & M. R. R. ....             | 626          |
| Liberty .....                                                                  | C., H. & D. R. R. ....         | 979          |
| Do. Mills .....                                                                | Eel R. R. R. ....              | 773          |
| Ligonier .....                                                                 | L. S. & M. S. R. R. ....       | 886          |
| Lima .....                                                                     | G. R. & Ind. R. R. ....        | 882          |
| Lisbon .....                                                                   | G. R. & Ind. R. R. ....        | 1,022        |
| Logansport .....                                                               | W., St. L. & P. R. R. ....     | 606          |
| London .....                                                                   | C., I., St. L. & C. R. R. .... | 775          |
| Loogootee .....                                                                | O. & M. R. R. ....             | 532          |
| Losantville .....                                                              | I., B. & W. R. R. ....         | 1,140        |
| Lowell .....                                                                   | J., M. & I. R. R. ....         | 636          |
| Lowrys .....                                                                   | L. E. & W. R. R. ....          | 874          |
| Lusburg .....                                                                  | C. W. & M. R. R. ....          | 830          |
| Lyons .....                                                                    | Inds. & V. R. R. ....          | 509          |
| Lynn, crossing G. R. & Ind. R. R. ....                                         | I., B. & W. R. R. ....         | 1,174        |
| McCord's .....                                                                 | C., C., C. & I. R. R. ....     | 854          |
| McCoy's .....                                                                  | C., I., St. L. & C. R. R. .... | 1,027        |
| McMillan's .....                                                               | J., M. & I. R. R. ....         | 1,010        |
| Madison .....                                                                  | J., M. & I. R. R. ....         | 451          |
| Do. foot of inclined plane .....                                               | J., M. & I. R. R. ....         | 472          |
| Manchester Avenue .....                                                        | C., C., C. & I. R. R. ....     | 721          |
| Manilla .....                                                                  | J., M. & I. R. R. ....         | 896          |
| Maplewood .....                                                                | I., D. & S. R. R. ....         | 842          |
| Marco .....                                                                    | Inds. & V. R. R. ....          | 482          |
| Marion .....                                                                   | Pan Handle R. R. ....          | 811          |
| Marshall .....                                                                 | I., D. & S. R. R. ....         | 700          |
| Marshfield .....                                                               | T., W. & W. R. R. ....         | 721          |
| Do .....                                                                       | J., M. & I. R. R. ....         | 543          |
| Martinsville .....                                                             | Inds. & V. R. R. ....          | 598          |
| Matthews .....                                                                 | Inds. & V. R. R. ....          | 691          |
| Maxwells .....                                                                 | I., B. & W. R. R. ....         | 920          |
| Maywood .....                                                                  | Inds. & V. R. R. ....          | 695          |
| Memphis .....                                                                  | J., M. & I. R. R. ....         | 490          |
| Messick .....                                                                  | I., B. & W. R. R. ....         | 1,030        |
| Mexico .....                                                                   | Eel R. R. R. ....              | 700          |
| Michigan City .....                                                            | M. C. R. R. ....               | 603          |
| Do. Lake .....                                                                 | U. S. Lake Survey .....        | 582          |
| Middle Fork .....                                                              | J., M. & I. R. R. ....         | 813          |
| Mier .....                                                                     | Pan Handle R. R. ....          | 816          |
| Milan .....                                                                    | O. & M. R. R. ....             | 985          |
| Milford .....                                                                  | C., W. & M. R. R. ....         | 850          |
| Do. Junction .....                                                             | B., P. & C. R. R. ....         | 841          |
| Millers .....                                                                  | L. S. & M. S. R. R. ....       | 625          |
| Do. Geodetic Station .....                                                     | U. S. Lake Survey .....        | 710          |
| Millersburgh .....                                                             | L. S. & M. S. R. R. ....       | 886          |
| Mishawaka .....                                                                | L. S. & M. S. R. R. ....       | 722          |
| Mitchell .....                                                                 | O. & M. R. R. ....             | 676          |
| Do. B. M. on window-sill W. corner of<br>S. W. face, M. N. Moore's store ..... | U. S. C. & G. S. ....          | 628          |
| Mitchellville .....                                                            | I., D. & S. R. R. ....         | 872          |
| Mongo, Geodetic Station .....                                                  | U. S. Lake Survey .....        | 1,027        |
| Montclair .....                                                                | I., D. & S. R. R. ....         | 759          |
| Montezuma .....                                                                | I., D. & S. R. R. ....         | 494          |
| Monticello .....                                                               | T., P. & W. R. R. ....         | 672          |
| Montmorency .....                                                              | L. E. & W. R. R. ....          | 672          |
| Montpelier .....                                                               | Ft. W., M. & C. R. R. ....     | 867          |
| Moonfield .....                                                                | I., D. & S. R. R. ....         | 705          |
| Moore's Hill .....                                                             | O. & M. R. R. ....             | 916          |
| Mooreville .....                                                               | Eel R. R. R. ....              | 877          |
| Do .....                                                                       | Inds. & V. R. R. ....          | 685          |
| Morris .....                                                                   | C., I., St. L. & C. R. R. .... | 982          |
| Morristown .....                                                               | C., H. & D. R. R. ....         | 842          |
| Mount Comfort .....                                                            | I., B. & W. R. R. ....         | 870          |
| Mount Vernon .....                                                             | St. L. & S. E. R. R. ....      | 407          |

| Station.                               | Authority.                     | Elevation    |
|----------------------------------------|--------------------------------|--------------|
|                                        |                                | <i>Feet.</i> |
| Mulberry .....                         | L. E. & W. R. R. ....          | 754          |
| Muncie .....                           | C., C., C. & I. R. R. ....     | 948          |
| Mundays .....                          | Inds. & V. R. R. ....          | 569          |
| New Albany .....                       | J. M. & I. R. R. ....          | 438          |
| Do. .... low water Ohio River. ....    | L., N. A. & C. R. R. ....      | 364          |
| Newbys .....                           | L. E. & W. R. R. ....          | 861          |
| New Carlisle .....                     | L. S. & M. S. R. R. ....       | 772          |
| New Castle .....                       | I. B. & W. R. R. ....          | 1,075        |
| New Era .....                          | Ft. W., J. & S. R. R. ....     | 859          |
| New Haven .....                        | T. W. & W. R. R. ....          | 753          |
| New Judson .....                       | P. K. & P. R. R. ....          | 681          |
| New Lisbon .....                       | Ft. W., M. & C. R. R. ....     | 1,098        |
| New Paris .....                        | C. W. & M. R. R. ....          | 828          |
| New Point .....                        | C., I., St. L. & C. R. R. .... | 981          |
| Newport .....                          | E., T. H. & C. R. R. ....      | 494          |
| New Providence .....                   | L., N. A. & C. R. R. ....      | 551          |
| Nixon .....                            | I. B. & W. R. R. ....          | 1,015        |
| North Grove .....                      | Pan-Handle R. R. ....          | 817          |
| North Judson .....                     | Pan-Handle R. R. ....          | 702          |
| North Madison .....                    | J., M. & I. R. R. ....         | 878          |
| Do. .... top of inclined plane. ....   | J., M. & I. R. R. ....         | 876          |
| Do. .... summit of line. ....          | J., M. & I. R. R. ....         | 880          |
| North Manchester .....                 | Eel R. R. R. ....              | 775          |
| North Salem .....                      | I., D. & S. R. R. ....         | 868          |
| North Vernon .....                     | J., M. & I. R. R. ....         | 727          |
| Do. .... O. & M. R. R. crossing. ....  | J., M. & I. R. R. ....         | 727          |
| Numa .....                             | E., T. H. & C. R. R. ....      | 522          |
| Oakland .....                          | C., C., C. & I. R. R. ....     | 846          |
| Oakley .....                           | I., D. & S. R. R. ....         | 898          |
| Onward .....                           | Pan-Handle R. R. ....          | 763          |
| Opedu .....                            | E., T. H. & C. R. R. ....      | 510          |
| Orleans .....                          | L., N. A. & C. R. R. ....      | 633          |
| Osceola .....                          | L. S. & M. S. R. R. ....       | 737          |
| Osgood .....                           | O. & M. R. R. ....             | 950          |
| Ossian .....                           | Ft. W., M. & C. R. R. ....     | 831          |
| Otis .....                             | L. S. & M. S. R. R. ....       | 765          |
| Otterbien .....                        | L. E. & W. R. R. ....          | 685          |
| Oxford .....                           | L. E. & W. R. R. ....          | 703          |
| Palestine .....                        | C., H. & D. R. R. ....         | 831          |
| Paragon .....                          | Inds. & V. R. R. ....          | 577          |
| Parker .....                           | C., C., C. & I. R. R. ....     | 1,023        |
| Peudleton .....                        | C., C., C. & I. R. R. ....     | 847          |
| Penn. Geodetic Station .....           | U. S. Lake Survey. ....        | 691          |
| Perryville .....                       | E., T. H. & C. R. R. ....      | 582          |
| Perryssville .....                     | C. & E. Ill. R. R. ....        | 468          |
| Peru .....                             | W., St. L. & P. R. R. ....     | 655          |
| Do. court-house square. ....           | W. & E. Canal. ....            | 657          |
| Pierceville .....                      | O. & M. R. R. ....             | 1,010        |
| Pine .....                             | L. S. & M. S. R. R. ....       | 699          |
| Plainville .....                       | T. H. & Inds. R. R. ....       | 742          |
| Pleasant Lake .....                    | Ft. W., J. & S. R. R. ....     | 975          |
| Plymouth .....                         | P., K. & P. R. R. ....         | 769          |
| Plymouth .....                         | P., Ft. W. & C. R. R. ....     | 781          |
| Do. .... surface of Yellow River. .... | P., Ft. W. & C. R. R. ....     | 760          |
| Poplar Grove .....                     | C., I., St. L. & C. R. R. .... | 849          |
| Porter .....                           | M. C. R. R. ....               | 647          |
| Portland, low water Salamonie R. ....  | C., R. & Ft. W. R. R. ....     | 904          |
| Potters .....                          | Eel R. R. R. ....              | 861          |
| Prescott .....                         | C., I., St. L. & C. R. R. .... | 792          |
| Princeton .....                        | E. & T. H. R. R. ....          | 483          |
| Prison Station .....                   | J., M. & I. R. R. ....         | 462          |
| Putnamville .....                      | L., N. A. & C. R. R. ....      | 667          |
| Quincy .....                           | L., N. A. & C. R. R. ....      | 749          |
| Raccoon .....                          | I., D. & S. R. R. ....         | 745          |

| Station.                                       | Authority.                     | Elevation.   |
|------------------------------------------------|--------------------------------|--------------|
|                                                |                                | <i>Feet.</i> |
| Red Cut .....                                  | L., N. A. & C. R. R .....      | 832          |
| Reeds .....                                    | L. E. & W. R. R .....          | 936          |
| Reelsville .....                               | T. H. & Inds. R. R .....       | 638          |
| Remington .....                                | T., P. & W. R. R .....         | 732          |
| Retreat .....                                  | J., M. & I. R. R .....         | 540          |
| Reynolds .....                                 | T., P. & W. R. R .....         | 692          |
| Richmond .....                                 | C., R. & Ft. W. R. R .....     | 969          |
| Richmond, low water of White River .....       | C., R. & Ft. W. R. R .....     | 885          |
| Ridgeville .....                               | Pan-Handle R. R .....          | 994          |
| Do...railroad crossing .....                   | C., R. & Ft. W. R. R .....     | 993          |
| Do...low water Mississinewa River .....        |                                | 964          |
| Riley .....                                    | T. H. & S. E. R. R .....       | 569          |
| Roachdale .....                                | I., D. & S. R. R .....         | 839          |
| Roann .....                                    | Eel R. R. R .....              | 750          |
| Rock Creek .....                               | J., M. & I. R. R .....         | 665          |
| Rockford .....                                 | J., M. & I. R. R .....         | 545          |
| Do...bridge over White River .....             | J., M. & I. R. R .....         | 585          |
| Rolling Prairie .....                          | L. S. & M. S. R. R .....       | 821          |
| Rome City .....                                | G. R. & Ind. R. R .....        | 920          |
| Rosedale .....                                 | Pan-Handle R. R .....          | 722          |
| Ross .....                                     | J. & N. Ind. R. R .....        | 636          |
| Royal Centre .....                             | Pan-Handle R. R .....          | 735          |
| Rushville .....                                | J., M. & I. R. R .....         | 964          |
| Do...C., H. & I. R. R .....                    | J., M. & I. R. R .....         | 972          |
| Russellville .....                             | I., D. & S. R. R .....         | 823          |
| Saint Johns .....                              | J., M. & I. R. R .....         | 763          |
| Saint Louis .....                              | J., M. & I. R. R .....         | 683          |
| Saint Paul .....                               | C., I., St. L. & C. R. R ..... | 852          |
| Salamonie, low water of Wabash River .....     | W. & E. Canal .....            | 667          |
| Salem .....                                    | L., N. A. & C. R. R .....      | 714          |
| Saline City .....                              | T. H. & S. E. R. R .....       | 555          |
| Sanborn .....                                  | Ind. & V. R. R .....           | 472          |
| San Pierre .....                               | P., K. & P. R. R .....         | 639          |
| Scipio .....                                   | J., M. & I. R. R .....         | 680          |
| Scottsburgh .....                              | J., M. & I. R. R .....         | 570          |
| Sedan .....                                    | L. S. & M. S. R. R .....       | 923          |
| Seeleyville .....                              | T. H. & Inds. R. R .....       | 585          |
| Sellersburgh .....                             | J., M. & I. R. R .....         | 478          |
| Selma .....                                    | C., C., C. & I. R. R .....     | 1,006        |
| Seymore .....                                  | J., M. & I. R. R .....         | 605          |
| Do...Ind., O. & M. R. R. crossing .....        | J., M. & I. R. R .....         | 608          |
| Shelbyville .....                              | J., M. & I. R. R .....         | 769          |
| Do...C. & I., St. L. & C. R. R. crossing ..... | J., M. & I. R. R .....         | 768          |
| Shoals, east front Wabash River .....          | O. & M. R. R .....             | 480          |
| Silver Lake .....                              | C., W. & M. R. R .....         | 927          |
| Smedley .....                                  | L., N. A. & C. R. R .....      | 875          |
| Smith's Crossing .....                         | C., I., St. L. & C. R. R ..... | 1,003        |
| Smithville .....                               | L., N. A. & C. R. R .....      | 717          |
| Smyth .....                                    | L., E. E. & S. W. R. R .....   | 379          |
| South Bend .....                               | L. S. & M. S. R. R .....       | 725          |
| Do .....                                       | Mich. A. L. R. R .....         | 679          |
| Do...L. S. & M. S. R. R. crossing .....        | Peninsula R. R .....           | 733          |
| Do...Saint Joseph's River .....                | Peninsula R. R .....           | 699          |
| Southport .....                                | J., M. & I. R. R .....         | 761          |
| South Waveland .....                           | I., D. & S. R. R .....         | 789          |
| South Whitley .....                            | Eel R. R. R .....              | 808          |
| Spades .....                                   | C., I., St. L. & C. R. R ..... | 1,013        |
| Sparta Lake .....                              | B., P. & C. R. R .....         | 938          |
| Speeds .....                                   | J., M. & I. R. R .....         | 465          |
| Spencer .....                                  | Inds. & V. R. R .....          | 557          |
| Spring Hill .....                              | T. H. & S. E. R. R .....       | 508          |
| Springport .....                               | Ft. W., M. & C. R. R .....     | 1,016        |
| Star City .....                                | Pan-Handle R. R .....          | 706          |
| Staunton .....                                 | T. H. & Inds. R. R .....       | 643          |

| Station.                                                                                                                                                            | Authority.                     | Elevation.   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|--------------|
|                                                                                                                                                                     |                                | <i>Feet.</i> |
| Stevens .....                                                                                                                                                       | L., E., E. & S. W. R. R. ....  | 379          |
| Stockford .....                                                                                                                                                     | St. L. & S. E. R. R. ....      | 390          |
| Sugar Creek .....                                                                                                                                                   | I., B. & W. R. R. ....         | 855          |
| Sullivan .....                                                                                                                                                      | E. & T. H. R. R. ....          | 538          |
| Summit .....                                                                                                                                                        | J., M. & I. R. R. ....         | 618          |
| Summit Grove .....                                                                                                                                                  | E., T. H. & C. R. R. ....      | 520          |
| Summit Station .....                                                                                                                                                | P., Ft. W. & C. R. R. ....     | 851          |
| Do .....                                                                                                                                                            | Ft. W., J. & S. R. R. ....     | 1,001        |
| Summitville .....                                                                                                                                                   | C., W. & M. R. R. ....         | 896          |
| Sunman .....                                                                                                                                                        | C., I., St. L. & C. R. R. .... | 1,015        |
| Switz City .....                                                                                                                                                    | Iuda. & V. R. R. ....          | 526          |
| Switzer .....                                                                                                                                                       | Pan-Handle R. R. ....          | 836          |
| Syracuse .....                                                                                                                                                      | B., P. & C. R. R. ....         | 870          |
| Talbot .....                                                                                                                                                        | L., E. & W. R. R. ....         | 710          |
| Taylor .....                                                                                                                                                        | Eel R. R. R. ....              | 864          |
| Taylorville .....                                                                                                                                                   | J., M. & I. R. R. ....         | 656          |
| Teegardin .....                                                                                                                                                     | B., P. & C. R. R. ....         | 794          |
| Templeton .....                                                                                                                                                     | L., E. & W. R. R. ....         | 675          |
| Terra Coupee .....                                                                                                                                                  | L. S. & M. S. R. R. ....       | 760          |
| Terre Haute .....                                                                                                                                                   | E., T. H. & C. R. R. ....      | 492          |
| Do.....Chestnut street.....                                                                                                                                         | C. & E. Ill. R. R. ....        | 492          |
| Do.....low water in Wabash River..                                                                                                                                  | C. & E. Ill. R. R. ....        | 445          |
| Do.....public square .....                                                                                                                                          | .....                          | 498          |
| Do.....Rockville R. R. crossing .....                                                                                                                               | T. H. & Inds. R. R. ....       | 492          |
| Do.....Alton R. R. crossing .....                                                                                                                                   | T. H. & Inds. R. R. ....       | 492          |
| Do.....7th street R. R. crossing .....                                                                                                                              | T. H. & Inds. R. R. ....       | 496          |
| Do.....3d street R. R. crossing .....                                                                                                                               | T. H. & Inds. R. R. ....       | 494          |
| Thorntown .....                                                                                                                                                     | Ind. & La F. R. R. ....        | 813          |
| Tippecanoe Crossing .....                                                                                                                                           | Pan-Handle R. R. ....          | 671          |
| Tipton .....                                                                                                                                                        | L., E. & W. R. R. ....         | 868          |
| Tolleston .....                                                                                                                                                     | M. C. R. R. ....               | 607          |
| Turkey Lake, high water .....                                                                                                                                       | B., P. & C. R. R. ....         | 863          |
| Tyrone .....                                                                                                                                                        | I., D. & S. R. R. ....         | 872          |
| Union .....                                                                                                                                                         | C., C., C. & I. R. R. ....     | 1,108        |
| Upton, R. R. transfer .....                                                                                                                                         | St. L. & S. E. R. R. ....      | 369          |
| Urbana .....                                                                                                                                                        | C., W. & M. R. R. ....         | 815          |
| Valentine .....                                                                                                                                                     | G. R. & Ind. R. R. ....        | 952          |
| Valley Mills .....                                                                                                                                                  | Inds. & V. R. R. ....          | 759          |
| Valparaiso .....                                                                                                                                                    | P., Ft. W. & C. R. R. ....     | 738          |
| Do .....                                                                                                                                                            | Peninsula R. R. ....           | 801          |
| Van Buren, Geodetic Station .....                                                                                                                                   | U. S. Lake Survey .....        | 950          |
| Vernon .....                                                                                                                                                        | J., M. & I. R. R. ....         | 686          |
| Do.....Muscatatauck Bridge .....                                                                                                                                    | J., M. & I. R. R. ....         | 669          |
| Vienna .....                                                                                                                                                        | J., M. & I. R. R. ....         | 566          |
| Vincennes .....                                                                                                                                                     | E. & T. H. R. R. ....          | 463          |
| Vincennes .....                                                                                                                                                     | C. & V. R. R. ....             | 417          |
| Do.....bench-mark on stone ledge<br>northwest front court-house.                                                                                                    | U. S. C. & G. S. ....          | 435          |
| Vincennes, bench-mark on center of top of<br>easternmost stone pier of United States<br>Coast and Geodetic Survey astronomical<br>observatory, court-house grounds. | U. S. C. & G. S. ....          | 431          |
| Vistula .....                                                                                                                                                       | L. S. & M. S. R. R. ....       | 809          |
| Wabash .....                                                                                                                                                        | W., St. L. & P. R. R. ....     | 735          |
| Wabash .....                                                                                                                                                        | T. W. & W. R. R. ....          | 740          |
| Do.....Court House Square .....                                                                                                                                     | W. & E. Canal .....            | 730          |
| Do.....W., St. L. & P., over crossing .....                                                                                                                         | C. W. & M. R. R. ....          | 742          |
| Walcott .....                                                                                                                                                       | T. P. & W. R. R. ....          | 715          |
| Walcottsville .....                                                                                                                                                 | G. R. & Ind. R. R. ....        | 938          |
| Waldron .....                                                                                                                                                       | C. I., St. L. & C. R. R. ....  | 819          |
| Walesboro .....                                                                                                                                                     | J., M. & I. R. R. ....         | 613          |
| Wallen .....                                                                                                                                                        | G. R. & Ind. R. R. ....        | 839          |
| Walnut Grove .....                                                                                                                                                  | E., T. H. & C. R. R. ....      | 528          |
| Wanatah .....                                                                                                                                                       | P., Ft. W. & C. R. R. ....     | 731          |

| Station.                                                                                               | Authority.                     | Elevation.   |
|--------------------------------------------------------------------------------------------------------|--------------------------------|--------------|
|                                                                                                        |                                | <i>Feet.</i> |
| Warren .....                                                                                           | L. S. & M. S. R. R. ....       | 731          |
| Warrington .....                                                                                       | I., B. & W. R. R. ....         | 1,020        |
| Warsaw .....                                                                                           | P., Ft. W. & C. R. R. ....     | 824          |
| Do. P., Ft. W. & C. crossing .....                                                                     | C. W. & M. R. R. ....          | 839          |
| Washington, B. M. on sill of basement window S. E. corner of court-house .....                         | U. S. C. & G. S. ....          | 510          |
| Washington .....                                                                                       | O. & M. R. R. ....             | 484          |
| Waterloo .....                                                                                         | L. S. & M. S. R. R. ....       | 897          |
| Do. ....                                                                                               | Inds. & V. R. R. ....          | 723          |
| Do. crossing L. S. & M. S. R. R. ....                                                                  | Ft. W., J. & S. R. R. ....     | 914          |
| Watsons .....                                                                                          | Ind. & V. R. R. ....           | 521          |
| Wawaka .....                                                                                           | L. S. & M. S. R. R. ....       | 896          |
| Waynesville .....                                                                                      | J., M. & I. R. R. ....         | 607          |
| Weisburgh .....                                                                                        | C., I., St. L. & C. R. R. .... | 929          |
| West Lebanon .....                                                                                     | T. W. & W. R. R. ....          | 720          |
| West Newton .....                                                                                      | Inds. & V. R. R. ....          | 779          |
| Westphalia .....                                                                                       | Inds. & V. R. R. ....          | 456          |
| West River .....                                                                                       | I., B. & W. R. R. ....         | 1,110        |
| West Shoals, B. M. on center of cross on face of stone cap of basement window on W. side of C. H. .... | U. S. C. & G. S. ....          | 523          |
| Westville .....                                                                                        | L., N. A. & C. R. R. ....      | 796          |
| Wheeler .....                                                                                          | P., Ft. W. & C. R. R. ....     | 666          |
| Whiteland .....                                                                                        | J., M. & I. R. R. ....         | 805          |
| Whitesville .....                                                                                      | L., N. A. & C. R. R. ....      | 874          |
| Whiting .....                                                                                          | L. S. & M. S. R. R. ....       | 606          |
| Wigs .....                                                                                             | J., M. & S. R. R. ....         | 635          |
| Williams .....                                                                                         | T. H. & Inds. R. R. ....       | 666          |
| Williamsport .....                                                                                     | T., W. & W. R. R. ....         | 619          |
| Willow Branch .....                                                                                    | I., B. & W. R. R. ....         | 950          |
| Winamac .....                                                                                          | Pan-Handle R. R. ....          | 713          |
| Winchester .....                                                                                       | C., C., C. & S. R. R. ....     | 1,089        |
| Do. at crossing of Bellefontaine R. R. ....                                                            | C. R. & Ft. W. R. R. ....      | 1,088        |
| Wirts .....                                                                                            | J., M. & I. R. R. ....         | 842          |
| Woodburn .....                                                                                         | T., W. & W. R. R. ....         | 750          |
| Worthington .....                                                                                      | Ind. & V. R. R. ....           | 522          |
| Do crossing .....                                                                                      | Ft. W., M. & C. R. R. ....     | 866          |
| Wrays .....                                                                                            | J., M. & I. R. R. ....         | 866          |
| Yorktown .....                                                                                         | C., C., C. & I. R. R. ....     | 924          |
| Zionsville .....                                                                                       | Inds. & La. F. R. R. ....      |              |



# INDIAN TERRITORY.

| Station.                                    | Authority.                  | Elevation.   |
|---------------------------------------------|-----------------------------|--------------|
|                                             |                             | <i>Feet.</i> |
| Adair .....                                 | Mo., Kans. & Tex. R. R..... | 634          |
| Arbuckle, Fort.....                         | Med. Dept., U. S. A.....    | 1,000        |
| Atoka .....                                 | Mo., Kans. & Tex. R. R..... | 556          |
| Beaversville.....                           | Pacific R. R. Reports.....  | 1,083        |
| Blue Jacket.....                            | Mo., Kans. & Tex. R. R..... | 779          |
| Bushy Head.....                             | A. & P. R. R.....           | 773          |
| Caddo .....                                 | Mo., Kans. & Tex. R. R..... | 705          |
| Caney .....                                 | Mo., Kans. & Tex. R. R..... | 530          |
| Cattall .....                               | A. & P. R. R.....           | 792          |
| Catoosa .....                               | A. & P. R. R.....           | 623          |
| Checota.....                                | Mo., Kans. & Tex. R. R..... | 587          |
| Chelsea .....                               | A. & P. R. R.....           | 718          |
| Choteau .....                               | Mo., Kans. & Tex. R. R..... | 684          |
| Claremore .....                             | A. & P. R. R.....           | 604          |
| Colbert .....                               | Mo., Kans. & Tex. R. R..... | 658          |
| Durant .....                                | Mo., Kans. & Tex. R. R..... | 639          |
| Eufala .....                                | Mo., Kans. & Tex. R. R..... | 617          |
| Fules .....                                 | A. & P. R. R.....           | 701          |
| Gibson .....                                | Mo., Kans. & Tex. R. R..... | 533          |
| Gibson, Fort, Signal Station.....           | U. S. Signal-Office.....    | 510          |
| Honey Springs .....                         | Toner .....                 | 568          |
| Kingfisher .....                            | .....                       | 950          |
| Lillietta .....                             | Mo., Kans. & Tex. R. R..... | 592          |
| Limestone Gap.....                          | Mo., Kans. & Tex. R. R..... | 645          |
| McAlister .....                             | Mo., Kans. & Tex. R. R..... | 684          |
| Mingo .....                                 | A. & P. R. R.....           | 606          |
| Muscogee .....                              | Mo., Kans. & Tex. R. R..... | 599          |
| Oaktata .....                               | Mo., Kans. & Tex. R. R..... | 590          |
| Perryville.....                             | Mo., Kans. & Tex. R. R..... | 708          |
| Reams .....                                 | Mo., Kans. & Tex. R. R..... | 609          |
| Sequoyah .....                              | A. P. R. R.....             | 696          |
| Shawnee Village .....                       | Pacific R. R. Reports ..... | 812          |
| Sill, Fort, Signal Station.....             | U. S. Signal-Office.....    | 1,190        |
| South Canadian.....                         | Mo., Kans. & Tex. R. R..... | 657          |
| Stringtown .....                            | Mo., Kans. & Tex. R. R..... | 625          |
| Towson, Fort .....                          | Med. Dept., U. S. A.....    | 300          |
| Vinita, Junction with St. L. & S. F. R. R.. | Mo., Kans. & Tex. R. R..... | 698          |
| Virdigris .....                             | A. & P. R. R.....           | 613          |
| White Oak.....                              | A. & P. R. R.....           | 772          |

# IOWA.

| Station.                                         | Authority.                      | Elevation.   |
|--------------------------------------------------|---------------------------------|--------------|
|                                                  |                                 | <i>Fest.</i> |
| Abbott.....                                      | Cent. Iowa R. R.....            | 1,176        |
| Ackley.....                                      | Cent. Iowa R. R.....            | 1,177        |
| Adams.....                                       | B., C. R. & N. R. R.....        | 608          |
| Adel.....                                        | D., M. & N. W. R. R.....        | 901          |
| Agency.....                                      | B. & M. R. R. R.....            | 801          |
| Albia.....                                       | B. & M. R. R. R.....            | 945          |
| Albion.....                                      | Cent. Iowa R. R.....            | 968          |
| Alden.....                                       | Toner.....                      | 1,165        |
| Algona.....                                      | Smithsonian Inst.....           | 1,500        |
| Alta.....                                        | Ill. Cent. R. R.....            | 1,519        |
| Ames.....                                        | C. & N. W. R. R.....            | 936          |
| Arcadia.....                                     | C. & N. W. R. R.....            | 1,439        |
| Ashawa.....                                      | D. M. & Ft. D. R. R.....        | 905          |
| Atkinson, Fort.....                              | Med. Dept., U. S. A.....        | 700          |
| Atlee.....                                       | Ft. M. & N. W. R. R.....        | 927          |
| Barnes City.....                                 | B., C. R. & N. R. R.....        | 900          |
| Barnum.....                                      | Toner.....                      | 1,173        |
| Bartlett.....                                    | K. C., St. J. & C. B. R. R..... | 949          |
| Batavia.....                                     | B. & M. R. R. R.....            | 640          |
| Bayfield.....                                    | B., C. R. & N. R. R.....        | 674          |
| Beacons.....                                     | C., R. I. & P. R. R.....        | 1,256        |
| Beaver.....                                      | C. & N. W. R. R.....            | 1,041        |
| Belknap (summit).....                            | W., St. L. & P. R. R.....       | 857          |
| Belleplaine.....                                 | C. & N. W. R. R.....            | 840          |
| Beloit.....                                      | S. C. & D. R. R.....            | 1,257        |
| Benbow.....                                      | Ft. M. & N. W. R. R.....        | 813          |
| Benson's Grove.....                              | M. & St. L. R. R.....           | 1,216        |
| Bertram.....                                     | C. & N. W. R. R.....            | 733          |
| Big Creek.....                                   | Toner.....                      | 590          |
| Blairsburgh.....                                 | Ill. Cent. R. R.....            | 1,237        |
| Blairstown.....                                  | C. & N. W. R. R.....            | 855          |
| Blencoe.....                                     | S. C. & P. R. R.....            | 1,056        |
| Bloomfield.....                                  | W., St. L. & P. R. R.....       | 855          |
| Do..junction with W., St. L. and<br>P. R. R..... | B. & S. R. R.....               | 894          |
| Boone.....                                       | C. & N. W. R. R.....            | 1,155        |
| Boonesborough.....                               | Toner.....                      | 1,160        |
| Bowen's Prairie.....                             | Toner.....                      | 800          |
| Brainard.....                                    | B., C. R. & N. R. R.....        | 909          |
| Britt.....                                       | M. & St. L. R. R.....           | 1,230        |
| Brooklyn.....                                    | C., R. I. & P. R. R.....        | 836          |
| Burlington, H. W. Miss. River, 1851.....         | B. & M. R. R. R.....            | 523          |
| Do..H. W. Miss. River, 1870.....                 | B. & M. R. R. R.....            | 518          |
| Do..L. W. Miss. River, 1870.....                 | B. & M. R. R. R.....            | 505          |
| Do..crossing Main street.....                    | C., B. & Q. R. R.....           | 526          |
| Do..bridge.....                                  | C., B. & Q. R. R.....           | 537          |
| Calamus.....                                     | C. & N. W. R. R.....            | 721          |
| Caldwell.....                                    | B. & S. R. R.....               | 857          |
| California Junction.....                         | S. C. & P. R. R.....            | 1,024        |
| Callender.....                                   | D. M. & Ft. D. R. R.....        | 1,167        |
| Calliope.....                                    | S., C. & D. R. R.....           | 1,200        |
| Calmar.....                                      | C., M. & St. P. R. R.....       | 1,269        |
| Cantril.....                                     | B. & S. R. R.....               | 776          |
| Carroll.....                                     | C. & N. W. R. R.....            | 1,240        |
| Cascade.....                                     | D. & St. P. R. R.....           | 770          |
| Casey.....                                       | C., R. I. & P. R. R.....        | 1,226        |
| Castalia.....                                    | C., M. & St. P. R. R.....       | 1,257        |
| Cedar Creek.....                                 | Toner.....                      | 616          |

| Station.                                      | Authority.                      | Elevation.   |
|-----------------------------------------------|---------------------------------|--------------|
|                                               |                                 | <i>Feet.</i> |
| Cedar Falls .....                             | B., C. R. & N. R. R. ....       | 844          |
| Do.... water in Cedar River .....             | C., F. & M. R. R. ....          | 859          |
| Cedar Rapids .....                            | C. & N. W. R. R. ....           | 744          |
| Do.... City datum .....                       | City engineer .....             | 719          |
| Central City .....                            | Toner .....                     | 986          |
| Centredale .....                              | B., C. R. & N. R. R. ....       | 715          |
| Centre Point .....                            | B., C. R. & N. R. R. ....       | 809          |
| Centerville, crossing C. R. I. & P. at grade. | Mo., Iowa & Neb. R. R. ....     | 1,013        |
| Ceres .....                                   | Toner .....                     | 825          |
| Chapin .....                                  | Cent. Iowa R. R. ....           | 1,246        |
| Chariton .....                                | B. & M. R. R. ....              | 1,030        |
| Charles City .....                            | C. M. & St. P. R. R. ....       | 1,012        |
| Charleston .....                              | K. & N. W. R. R. ....           | 676          |
| Chequaque .....                               | B. & M. R. R. R. ....           | 605          |
| Cherokee .....                                | Ill. Cent. R. R. ....           | 1,211        |
| Chester .....                                 | C., M. & St. P. R. R. ....      | 1,244        |
| Chickasaw .....                               | C., M. & St. P. R. R. ....      | 1,148        |
| Chillicothe .....                             | B. & M. R. R. R. ....           | 645          |
| Cincinnati .....                              | B. & S. R. R. ....              | 1,037        |
| Clarence .....                                | C. & N. W. R. R. ....           | 841          |
| Clarenda .....                                | B. & M. R. R. R. ....           | 1,069        |
| Clarenda Junction .....                       | B. & M. R. R. R. ....           | 1,097        |
| Clarksville .....                             | B., C. R. & N. R. R. ....       | 914          |
| Clear Lake .....                              | .....                           | 984          |
| Do.... depot .....                            | C., M. & St. P. R. R. ....      | 1,237        |
| Clermont .....                                | B., C. R. & N. R. R. ....       | 856          |
| Clinton (station grounds) .....               | C. & N. W. R. R. ....           | 609          |
| Do.... H. W. Miss. River .....                | C. & N. W. R. R. ....           | 587          |
| Clorinda .....                                | Mo., Iowa & Neb. R. R. ....     | 1,032        |
| Coalfield .....                               | Cent. Iowa R. R. ....           | 725          |
| Colburg .....                                 | B. & M. R. R. R. ....           | 1,008        |
| Colfax .....                                  | Toner .....                     | 753          |
| Colo .....                                    | C. & N. W. R. R. ....           | 1,059        |
| Columbus Junction .....                       | B., C. R. & N. R. R. ....       | 585          |
| Cone .....                                    | B., C. R. & N. R. R. ....       | 608          |
| Conover .....                                 | C. M. & St. P. R. R. ....       | 1,247        |
| Coon River .....                              | .....                           | 1,017        |
| Corinth .....                                 | M. & St. L. R. R. ....          | 1,180        |
| Corning .....                                 | B. & M. R. R. ....              | 1,127        |
| Corydon .....                                 | Mo., Iowa & Neb. R. R. ....     | 1,092        |
| Council Bluffs U. P. transfer depot .....     | K. C. St. J. & C. B. R. R. .... | 989          |
| Do.... U. P. bridge, abutments .....          | K. C. St. J. & C. B. R. R. .... | 1,038        |
| Do.... Bed Mo. R. ....                        | K. C. St. J. & C. B. R. R. .... | 963          |
| Do.... H. W. Mo. R. ....                      | K. C. St. J. & C. B. R. R. .... | 966          |
| Do.... L. W. Mo. R. ....                      | K. C. St. J. & C. B. R. R. .... | 967          |
| Crawfordsville .....                          | B. & M. R. R. R. ....           | 692          |
| Crescent .....                                | .....                           | 1,209        |
| Cresco .....                                  | C., M. & St. P. R. R. ....      | 1,312        |
| Cromwell .....                                | B. & M. R. R. R. ....           | 1,220        |
| Dallas Centre .....                           | D., M. & Ft. D. R. R. ....      | 1,065        |
| Danville .....                                | B. & M. R. R. R. ....           | 715          |
| Davenport .....                               | C., R. I. & P. R. R. ....       | 578          |
| Do.... Signal Station .....                   | U. S. Signal Office .....       | 615          |
| Do.... City datum .....                       | City engineer .....             | 534          |
| Do.... H. W. Miss. R. ....                    | City engineer .....             | 556          |
| Do.... L. W. Miss. R. ....                    | City engineer .....             | 539          |
| Davis Creek .....                             | Toner .....                     | 649          |
| Deam .....                                    | Mo., Iowa & Neb. R. R. ....     | 825          |
| Decorah .....                                 | C., M. & St. P. R. R. ....      | 900          |
| Delassus .....                                | Toner .....                     | 1,068        |
| Delavan .....                                 | Toner .....                     | 636          |
| Delaware .....                                | Ill. Cent. R. R. ....           | 1,084        |
| Do.. crossing D. & I. R. R. ....              | D. & St. P. R. R. ....          | 938          |

| Station.                                     | Authority.                      | Elevation.   |
|----------------------------------------------|---------------------------------|--------------|
|                                              |                                 | <i>Feet.</i> |
| Delaware, crossing D. & S. C. R. R.....      | D. & St. P. R. R.....           | 1,083        |
| Do.. Centre.....                             | .....                           | 1,106        |
| Denison.....                                 | C. & N. W. R. R.....            | 1,192        |
| Des Moines, station C., R. I. & P. R. R..... | City engineer.....              | 800          |
| Do..... station C., & N. W. R. R.....        | City engineer.....              | 798          |
| Do..... station D., M. & N. W. R. R.....     | City engineer.....              | 807          |
| Do..... station K. & D. M. R. R.....         | City engineer.....              | 799          |
| Do..... L. W. in Des Moines R.....           | City engineer.....              | 776          |
| Des Moines, Signal Station.....              | U. S. Signal Office.....        | 849          |
| De Soto.....                                 | C., R. I. & P. R. R.....        | 886          |
| Dewey.....                                   | Ft. M. & N. W. R. R.....        | 813          |
| Dewitt, crossing D. & St. P. R. R.....       | C. & N. W. R. R.....            | 699          |
| Dexter.....                                  | C., R. I. & P. R. R.....        | 1,146        |
| Dillon.....                                  | Cent. Iowa R. R.....            | 985          |
| Donaldson.....                               | B. & S. R. R.....               | 707          |
| Donnellson.....                              | K. & N. W. R. R.....            | 681          |
| Doon.....                                    | St. P. & S. C. R. R.....        | 1,282        |
| Downey.....                                  | C., R. I. & P. R. R.....        | 683          |
| Dry Creek.....                               | Toner.....                      | 1,003        |
| Dubuque.....                                 | Ill. Cent. R. R.....            | 614          |
| Do.. City datum.....                         | Ill. Cent. R. R.....            | 595          |
| Do.. Signal Station.....                     | U. S. Signal Office.....        | 635          |
| Duncombe.....                                | Ill. Cent. R. R.....            | 1,118        |
| Durant.....                                  | C., R. I. & P. R. R.....        | 712          |
| Dye.....                                     | Ft. M. & N. W. R. R.....        | 814          |
| Dyersville.....                              | Ill. Cent. R. R.....            | 940          |
| Dysart.....                                  | B., C. R. & N. R. R.....        | 958          |
| Earlham.....                                 | C., R. I. & P. R. R.....        | 1,106        |
| East Nebraska City, Junction.....            | K. C., St. J. & C. B. R. R..... | 926          |
| Do..... Depot.....                           | K. C., St. J. & C. B. R. R..... | 928          |
| East Orange.....                             | St. P. & S. C. R. R.....        | 1,302        |
| East Plattsmouth.....                        | Toner.....                      | 924          |
| Eastport.....                                | Mo., Iowa & Neb. R. R.....      | 926          |
| Do.. rail K. C., St. J. & C., B. R. R.....   | Mo., Iowa & Neb. R. R.....      | 929          |
| Do.. water in Mo. River March 12, 1871.....  | Mo., Iowa & Neb. R. R.....      | 912          |
| Eddyville.....                               | Cent. Iowa R. R.....            | 672          |
| Do.. Des Moines River "surface".....         | Cent. Iowa R. R.....            | 698          |
| Eldora.....                                  | Cent. Iowa R. R.....            | 1,153        |
| Elgin.....                                   | B., C. R. & N. R. R.....        | 833          |
| Elm Creek.....                               | Toner.....                      | 1,094        |
| Elmira.....                                  | B., C. R. & N. R. R.....        | 741          |
| Ely.....                                     | B., C. R. & N. R. R.....        | 731          |
| Essex.....                                   | B. & M. R. R. R.....            | 996          |
| Exline.....                                  | B. & S. R. R.....               | 1,016        |
| Fairbanks.....                               | Toner.....                      | 1,083        |
| Fairfax.....                                 | C. & N. W. R. R.....            | 784          |
| Fairfield.....                               | B. & M. R. R. R.....            | 767          |
| Farley.....                                  | Ill. Cent. R. R.....            | 1,111        |
| Farmington, crossing K. & D. M. R. R.....    | B. & S. R. R.....               | 571          |
| Farragut.....                                | B. & M. R. R. R.....            | 963          |
| Fayette Village.....                         | Smithsonian Inst.....           | 1,000        |
| Floyd.....                                   | I. C., C., F. & M. R. R.....    | 1,107        |
| Forest City.....                             | M. & St. L. R. R.....           | 1,220        |
| Fort Atkinson.....                           | C., M. & St. P. R. R.....       | 1,023        |
| Fort Dodge.....                              | D. M. & Ft. D. R. R.....        | 1,015        |
| Do.....                                      | Ill. Cent. R. R.....            | 1,032        |
| Do.....                                      | M. & St. L. R. R.....           | 1,120        |
| Fort Madison.....                            | C. B. & Q. R. R.....            | 516          |
| Do.....                                      | Ft. M. & N. W. R. R.....        | 632          |
| Do..... 14th st.....                         | Ft. M. & N. W. R. R.....        | 644          |
| Franklin.....                                | B. & S. R. R.....               | 702          |
| Do.....                                      | Cent. Iowa R. R.....            | 1,193        |
| Frederic.....                                | B. & M. R. R. R.....            | 735          |
| Fredericksburgh.....                         | Toner.....                      | 765          |

| Station.                                 | Authority.                      | Elevation.   |
|------------------------------------------|---------------------------------|--------------|
|                                          |                                 | <i>Feet.</i> |
| Fulton.....                              | C., R. I. & P. R. R.....        | 758          |
| Garner.....                              | C., M. & St. P. R. R.....       | 1,227        |
| Garrison.....                            | B., C. R. & N. R. R.....        | 849          |
| Geneva.....                              | Cent. Iowa R. R.....            | 1,181        |
| Gifford.....                             | Cent. Iowa R. R.....            | 1,030        |
| Gilman.....                              | Cent. Iowa R. R.....            | 1,035        |
| Given.....                               | Cent. Iowa R. R.....            | 703          |
| Glendale.....                            | B. & M. R. R. R.....            | 745          |
| Glenwood.....                            | B. & M. R. R. R.....            | 979          |
| Gowrie.....                              | D. M. & Ft. D. R. R.....        | 1,154        |
| Graham.....                              | B., C. R. & N. R. R.....        | 816          |
| Grand Junction.....                      | C. & N. W. R. R.....            | 1,055        |
| Grand Mound.....                         | C. & N. W. R. R.....            | 736          |
| Greene.....                              | B., C. R. & N. R. R.....        | 943          |
| Grinnell.....                            | C., R. I. & P. R. R.....        | 1,011        |
| Grove City.....                          | C., R. I. & P. R. R.....        | 1,271        |
| Grundy Center.....                       | B., C. R. & N. R. R.....        | 968          |
| Guthrie.....                             | C., R. I. & P. R. R.....        | 1,269        |
| Guttenberg.....                          | Toner.....                      | 690          |
| Hamburg.....                             | K. C., St. J. & C. B. R. R..... | 912          |
| Do... Semaphore, B. & M. Junction.....   | K. C., St. J. & C. B. R. R..... | 902          |
| Hampton.....                             | Cent. Iowa R. R.....            | 1,240        |
| Hardin's Creek.....                      | Toner.....                      | 1,026        |
| Harmony.....                             | B., & M. R. R. R.....           | 1,040        |
| Harris Grove.....                        | Smithsonian Inst.....           | 900          |
| Haynes, side track.....                  | K. C., St. J. & C. B. R. R..... | 955          |
| Hazard.....                              | Toner.....                      | 1,405        |
| Hazelton.....                            | B., C. R. & N. R. R.....        | 968          |
| Hepburn.....                             | B., & M. R. R. R.....           | 1,078        |
| Hesper.....                              | Smithsonian Inst.....           | 720          |
| Hickory Grove.....                       | Cent. Iowa R. R.....            | 810          |
| Holland.....                             | B., C. R. & N. R. R.....        | 965          |
| Homestead.....                           | C., R. I. & P. R. R.....        | 806          |
| Hosper.....                              | St. P. & S. C. R. R.....        | 1,338        |
| Humboldt.....                            | Ft. D. & Ft. R. R. R.....       | 1,062        |
| Do.....                                  | M. & S. N. L. R. R.....         | 1,069        |
| Independence.....                        | Ill. Cent. R. R.....            | 921          |
| Do.....                                  | B., C. R. & N. R. R.....        | 1,111        |
| Iowa City.....                           | B., C. R. & N. R. R.....        | 644          |
| Do.....                                  | C., R. I. & P. R. R.....        | 671          |
| Iowa Junction.....                       | B., C. R. & N. R. R.....        | 618          |
| Jamesville.....                          | C. F. & M. R. R.....            | 892          |
| Jesup.....                               | Ill. Cent. R. R.....            | 990          |
| Julien.....                              | Toner.....                      | 845          |
| Kalona.....                              | B., C. R. & N. R. R.....        | 651          |
| Kellogg.....                             | C., R. I. & P. R. R.....        | 839          |
| Kennedy.....                             | D. M. & N. W. R. R.....         | 968          |
| Kensett.....                             | Cent. Iowa R. R.....            | 1,306        |
| Keokuk, Water Street depot.....          | C. B. & Q. R. R.....            | 501          |
| Do... city datum.....                    | City Engineer.....              | 480          |
| Do... track on bridge.....               | City Engineer.....              | 544          |
| Do... Signal Station.....                | U. S. Signal Office.....        | 618          |
| Keswick.....                             | B., C. R. & N. R. R.....        | 868          |
| Kinross.....                             | B., C. R. & N. R. R.....        | 757          |
| Kossuth.....                             | B., C. R. & N. R. R.....        | 769          |
| Lacey.....                               | Cent. Iowa R. R.....            | 850          |
| Lake Mills.....                          | M. & St. L. R. R.....           | 1,264        |
| La Porte.....                            | B., C. R. & N. R. R.....        | 802          |
| La Grande.....                           | C. & N. W. R. R.....            | 953          |
| Le Mars.....                             | St. P. & S. C. R. R.....        | 1,221        |
| Do... Floyd River.....                   | St. P. & S. C. R. R.....        | 1,197        |
| Leon, cross branch, B. & M. R. R. R..... | Mo., Iowa & Neb. R. R.....      | 1,02         |
| Le Roy.....                              | C. M. & St. P. R. R.....        | 1,29         |

| Station.                                             | Authority.                       | Elevation.   |
|------------------------------------------------------|----------------------------------|--------------|
|                                                      |                                  | <i>Feet.</i> |
| Lime Springs .....                                   | C. M. & St. P. R. R. ....        | 1,258        |
| Linden .....                                         | D. M. & N. W. R. R. ....         | 1,139        |
| Linton .....                                         | B., C. R. & N. R. R. ....        | 761          |
| Lisbon .....                                         | C. & N. W. R. R. ....            | 888          |
| Liscomb .....                                        | Cent. Iowa R. R. ....            | 1,078        |
| Livermore .....                                      | M. & St. L. R. R. ....           | 1,135        |
| Do .....                                             | Ft. D. & Ft. R. R. R. ....       | 1,128        |
| Logan .....                                          | Toner .....                      | 928          |
| London .....                                         | C. & N. W. R. R. ....            | 733          |
| Lone Tree .....                                      | B., C. R. & N. R. R. ....        | 718          |
| Loveland, B. & M. R. R. R. station .....             | Mo., Iowa & Neb. R. R. ....      | 969          |
| Lowden .....                                         | B. & M. R. R. R. ....            | 1,205        |
| Low Moor .....                                       | C. & N. W. R. R. ....            | 657          |
| Luana .....                                          | C., M. & St. P. R. R. ....       | 1,132        |
| Lucas .....                                          | Toner .....                      | 857          |
| Lyons City .....                                     | Smithsonian Inst. ....           | 630          |
| McGregor, L. W. Miss. R. ....                        | C., M. & St. P. R. R. ....       | 616          |
| Do .....                                             | C., M. & St. P. R. R. ....       | 634          |
| McPaul .....                                         | K. C., St. J. & C. B. R. R. .... | 940          |
| Madison .....                                        | .....                            | 600          |
| Manchester .....                                     | Ill. Cent. R. R. ....            | 950          |
| Manly Junction .....                                 | B., C. R. & N. R. R. ....        | 1,189        |
| Do .....                                             | Cent. Iowa R. R. ....            | 1,291        |
| Manson .....                                         | Ill. Cent. R. R. ....            | 1,245        |
| Marblerock .....                                     | B., C. R. & N. R. R. ....        | 992          |
| Marcus .....                                         | Ill. Cent. R. R. ....            | 1,469        |
| Marshalltown, crossing Iowa Central R. R. ....       | C. & N. W. R. R. ....            | 898          |
| Mary's Ford .....                                    | Toner .....                      | 1,148        |
| Mason City .....                                     | C., M. & St. P. R. R. ....       | 1,130        |
| Maynard .....                                        | B., C. R. & N. R. R. ....        | 1,096        |
| Mechanicsville .....                                 | C. & N. W. R. R. ....            | 912          |
| Mediapolis .....                                     | B. & N. R. R. ....               | 756          |
| Melrose .....                                        | B. & M. R. R. R. ....            | 853          |
| Meriden .....                                        | Ill. Cent. R. R. ....            | 1,412        |
| Middletown .....                                     | B. & M. R. R. R. ....            | 725          |
| Milton .....                                         | B. & S. R. R. ....               | 806          |
| Minburn .....                                        | D. M. & Ft. D. R. R. ....        | 1,062        |
| Missouri Valley, junction with S. C. & P. R. R. .... | C. & N. W. R. R. ....            | 1,022        |
| Mitchell .....                                       | C. F. & M. R. R. ....            | 1,202        |
| Mitchellville .....                                  | C., R. I. & P. R. R. ....        | 966          |
| Modale .....                                         | S. C. & P. R. R. ....            | 1,029        |
| Moingona, bridge over Des Moines River..             | C. & N. W. R. R. ....            | 907          |
| Do .....                                             | C. & N. W. R. R. ....            | 870          |
| Mona .....                                           | Ill. Cent. R. R. ....            | 1,203        |
| Mondamin .....                                       | S. C. & P. R. R. ....            | 1,038        |
| Monona .....                                         | C., M. & St. P. R. R. ....       | 1,221        |
| Montezuma .....                                      | B., C. R. & N. R. R. ....        | 948          |
| Monticello (near) .....                              | Smithsonian Inst. ....           | 800          |
| Montour .....                                        | C. & N. W. R. R. ....            | 868          |
| Morning Sun .....                                    | B., C. R. & N. R. R. ....        | 835          |
| Morrison .....                                       | B., C. R. & N. R. R. ....        | 937          |
| Morse .....                                          | B., C. R. & N. R. R. ....        | 753          |
| Moscow .....                                         | C., R. I. & P. R. R. ....        | 652          |
| Moulton .....                                        | W., St. L. & P. R. R. ....       | 994          |
| Do .....                                             | B. & S. R. R. ....               | 994          |
| Mount Auburn .....                                   | B., C. R. & N. R. R. ....        | 853          |
| Mount Ayr .....                                      | Mo., Iowa & Neb. R. R. ....      | 1,236        |
| Mount Pleasant .....                                 | B. & M. R. R. R. ....            | 725          |
| Mount Sterling .....                                 | B. & S. R. R. ....               | 649          |
| Mount Union .....                                    | B. & N. R. R. ....               | 712          |
| Mount Vernon .....                                   | C. & N. W. R. R. ....            | 858          |
| Murray .....                                         | Toner .....                      | 1,183        |

| Station.                                       | Authority.                       | Elevation.   |
|------------------------------------------------|----------------------------------|--------------|
|                                                |                                  | <i>Feet.</i> |
| Muscatine .....                                | B., C. R. & N. R. R. ....        | 544          |
| Nashua .....                                   | C., F. & M. R. R. ....           | 975          |
| Nevada .....                                   | C. & N. W. R. R. ....            | 1,017        |
| New Boston .....                               | K. & N. W. R. R. ....            | 674          |
| Newburgh .....                                 | Cent. Iowa R. R. ....            | 1,036        |
| New Hampton .....                              | C., M. & St. P. R. R. ....       | 1,166        |
| New Jefferson .....                            | C. & N. W. R. R. ....            | 1,071        |
| New Sharon .....                               | Cent. Iowa R. R. ....            | 877          |
| Newton .....                                   | C., R. I. & P. R. R. ....        | 958          |
| Nichols .....                                  | B., C. R. & N. R. R. ....        | 628          |
| Nishnabotany .....                             | Toner .....                      | 1,151        |
| Nodaway .....                                  | B. & M. R. R. R. ....            | 1,080        |
| Nora Junction .....                            | B., C. R. & N. R. R. ....        | 1,052        |
| Norman .....                                   | M. & St. L. R. R. ....           | 1,279        |
| North McGregor .....                           | C., M. & St. P. R. R. ....       | 633          |
| North Union .....                              | Toner .....                      | 1,250        |
| Northwood .....                                | B. C., R. & N. R. R. ....        | 1,210        |
| Norway .....                                   | C. & N. W. R. R. ....            | 809          |
| Oakland .....                                  | B. & M. R. R. R. ....            | 1,193        |
| Oasis .....                                    | B., C. R. & N. R. R. ....        | 790          |
| Oelwein .....                                  | B., C. R. & N. R. R. ....        | 1,039        |
| Ogden .....                                    | C. & N. W. R. R. ....            | 1,109        |
| Onana City .....                               | S. C. & P. R. R. ....            | 1,064        |
| Ortonville .....                               | D. M. & N. W. R. R. ....         | 1,055        |
| Osage .....                                    | I. C., C. F. & M. R. R. ....     | 1,178        |
| Osceola .....                                  | B. & M. R. R. R. ....            | 1,123        |
| Oskaloosa .....                                | Cent. Iowa R. R. ....            | 850          |
| Ossian .....                                   | C., M. & St. P. R. R. ....       | 1,281        |
| Ottumwa .....                                  | B. & M. R. R. R. ....            | 630          |
| Oxford .....                                   | C., R. I. & P. R. R. ....        | 720          |
| Pacific Junction, C. B. & Q. R. crossing ..... | K. C., St. J. & C. B. R. R. .... | 960          |
| Do.....depot .....                             | K. C., St. J. & C. B. R. R. .... | 961          |
| Palo .....                                     | B., C. R. & N. R. R. ....        | 741          |
| Panora .....                                   | D. M. & N. W. R. R. ....         | 1,074        |
| Parkersburgh .....                             | Toner .....                      | 953          |
| Paton .....                                    | D. M. & Ft. D. R. R. ....        | 1,116        |
| Peosta .....                                   | Ill. Cent. R. R. ....            | 747          |
| Percival .....                                 | K. C., St. J. & C. B. R. R. .... | 933          |
| Perry .....                                    | D. M. & Ft. D. R. R. ....        | 977          |
| Pitman .....                                   | Ft. M. & N. W. R. R. ....        | 631          |
| Plainfield .....                               | C. F. & M. R. R. ....            | 926          |
| Pleasant Plain .....                           | Smithsonian Inst. ....           | 950          |
| Plymouth Junction .....                        | B., C. R. & N. R. R. ....        | 1,114        |
| Pomeroy .....                                  | Toner .....                      | 1,244        |
| Portlandville .....                            | S. C. & D. R. R. ....            | 1,162        |
| Postville .....                                | C. M. & St. P. R. R. ....        | 1,207        |
| Poultney .....                                 | Toner .....                      | 800          |
| Prairie Creek .....                            | Toner .....                      | 699          |
| Pulaski .....                                  | B. & S. R. R. ....               | 840          |
| Quarry .....                                   | C. & N. W. R. R. ....            | 808          |
| Quasqueton .....                               | Smithsonian Inst. ....           | 888          |
| Randalia .....                                 | B., C. R. & N. R. R. ....        | 1,096        |
| Redfield .....                                 | D. M. & N. W. R. R. ....         | 968          |
| Red Oak .....                                  | B. & M. R. R. ....               | 1,033        |
| Reinbeck .....                                 | B., C. R. & N. R. R. ....        | 916          |
| Remsen .....                                   | Toner .....                      | 1,335        |
| Rippey .....                                   | D. M. & Ft. D. R. R. ....        | 1,080        |
| Riverside .....                                | B., C. R. & N. R. R. ....        | 631          |
| River Sioux .....                              | S. C. & P. R. R. ....            | 1,063        |
| Riverton .....                                 | B. & M. R. R. R. ....            | 931          |
| Rock Falls .....                               | B., C. R. & N. R. R. ....        | 1,094        |
| Rockford .....                                 | B., C. R. & N. R. R. ....        | 1,011        |
| Rock Rapids .....                              | St. P. & S. C. R. R. ....        | 1,344        |
| Rockwell .....                                 | Cent. Iowa R. R. ....            | 1,219        |

| Station.                                            | Authority.                       | Elevation.   |
|-----------------------------------------------------|----------------------------------|--------------|
|                                                     |                                  | <i>Feet.</i> |
| <b>Rolfe</b> .....                                  | Smithsonian Inst .....           | 1,000        |
| <b>Roscoe</b> .....                                 | B. & N. R. R. ....               | 755          |
| <b>Rossville</b> .....                              | Smithsonian Inst .....           | 1,400        |
| <b>Rowley</b> .....                                 | B., C. R. & N. R. R. ....        | 960          |
| <b>Russell</b> .....                                | B. & M. R. R. ....               | 1,017        |
| <b>Sac City</b> .....                               | Toner .....                      | 900          |
| <b>St. Augar</b> .....                              | C. F. & M. R. R. ....            | 1,179        |
| <b>St. Gilman</b> .....                             | St. P. & S. C. R. R. ....        | 1,442        |
| <b>St. Mary's</b> .....                             | Smithsonian Inst .....           | 1,200        |
| <b>Salem</b> .....                                  | Toner .....                      | 684          |
| <b>Salix</b> .....                                  | S. C. & P. R. R. ....            | 1,097        |
| <b>Salt Creek</b> .....                             | Toner .....                      | 792          |
| <b>Sand Springs, crossing D. and I. R. R.</b> ..... | D. & St. P. R. R. ....           | 938          |
| <b>Sargeants</b> .....                              | S. C. & P. R. R. ....            | 1,008        |
| <b>Searsboro</b> .....                              | Cent. Iowa R. R. ....            | 810          |
| <b>Sedan, crossing B. and S. W., at grade</b> ..... | Mo., Iowa & Neb. R. R. ....      | 827          |
| <b>Seney</b> .....                                  | St. P. & S. C. R. R. ....        | 1,221        |
| <b>Sheffield</b> .....                              | Cent. Iowa R. R. ....            | 1,163        |
| <b>Sheldon</b> .....                                | St. P. & S. C. R. R. ....        | 1,406        |
| <b>Shell Rock</b> .....                             | B., C. R. & N. R. R. ....        | 911          |
| <b>Shellsburgh</b> .....                            | B., C. R. & N. R. R. ....        | 764          |
| <b>Shenandoah</b> .....                             | B. & M. R. R. R. ....            | 979          |
| <b>Sibley</b> .....                                 | St. P. & S. C. R. R. ....        | 1,509        |
| <b>Sioux City</b> .....                             | St. P. & C. R. R. ....           | 1,122        |
| <b>Sioux Valley</b> .....                           | S. C. & D. R. R. ....            | 1,185        |
| <b>Sloan</b> .....                                  | S. C. & P. R. R. ....            | 1,069        |
| <b>Solon</b> .....                                  | B., C. R. & N. R. R. ....        | 784          |
| <b>South English</b> .....                          | B., C. R. & N. R. R. ....        | 830          |
| <b>Sperry</b> .....                                 | B., C. R. & N. R. R. ....        | 747          |
| <b>Spring Valley</b> .....                          | D. & St. P. R. R. ....           | 1,236        |
| <b>Squaw Fork</b> .....                             | Toner .....                      | 915          |
| <b>Stanton</b> .....                                | Toner .....                      | 1,004        |
| <b>Stanwood</b> .....                               | C. & N. W. R. R. ....            | 863          |
| <b>State Center</b> .....                           | C. & N. W. R. R. ....            | 1,086        |
| <b>Steamboat Rock</b> .....                         | Cent. Iowa R. R. ....            | 1,061        |
| <b>Strawberry Point</b> .....                       | D. & St. P. R. R. ....           | 1,218        |
| <b>Summit Station</b> .....                         | C., F. & M. R. R. ....           | 1,084        |
| <b>Summitville</b> .....                            | K. & N. W. R. R. ....            | 666          |
| <b>Tama</b> .....                                   | C. & N. W. R. R. ....            | 832          |
| <b>Tara</b> .....                                   | D., M. & Ft. D. R. R. ....       | 1,159        |
| <b>Thayer</b> .....                                 | Toner .....                      | 1,002        |
| <b>Thornburgh</b> .....                             | B., C. R. & N. R. R. ....        | 868          |
| <b>Toddville</b> .....                              | B., C. R. & N. R. R. ....        | 770          |
| <b>Trader's Point</b> .....                         | K. C., St. J. & C. B. R. R. .... | 974          |
| <b>Trar</b> .....                                   | B., C. R. & N. R. R. ....        | 906          |
| <b>Tyrone</b> .....                                 | B. & M. R. R. R. ....            | 819          |
| <b>Union</b> .....                                  | Cent. Iowa R. R. ....            | 1,013        |
| <b>Vallisca</b> .....                               | B. & M. R. R. R. ....            | 1,058        |
| <b>Vawter's Grove</b> .....                         | Smithsonian Inst .....           | 1,500        |
| <b>Victor</b> .....                                 | C. R., I. & P. R. R. ....        | 806          |
| <b>Victoria</b> .....                               | Toner .....                      | 788          |
| <b>Viele</b> .....                                  | B. & S. R. R. ....               | 543          |
| <b>Vinton</b> .....                                 | B., C. R. & N. R. R. ....        | 800          |
| Do .....                                            | Smithsonian Inst .....           | 607          |
| <b>Walcott</b> .....                                | C., R. I. & P. R. R. ....        | 733          |
| <b>Walker</b> .....                                 | B., C. R. & N. R. R. ....        | 880          |
| <b>Walnut</b> .....                                 | B. & M. R. R. R. ....            | 1,040        |
| <b>Wapello</b> .....                                | B., C. R. & N. R. R. ....        | 578          |
| <b>Warren</b> .....                                 | B. & S. R. R. ....               | 709          |
| <b>Washburn</b> .....                               | B., C. R. & N. R. R. ....        | 817          |
| <b>Washington</b> .....                             | B. & N. R. R. ....               | 738          |
| <b>Waterloo</b> .....                               | Ill. Cent. R. R. ....            | 862          |
| <b>Waubeck</b> .....                                | Toner .....                      | 968          |
| <b>Wauke</b> .....                                  | D., M. & Ft. D. R. R. ....       | 1,049        |



| Station.                                      | Authority.                   | Elevation.   |
|-----------------------------------------------|------------------------------|--------------|
|                                               |                              | <i>Feet.</i> |
| Caldwell.....                                 | A., T. & S. F. R. R.....     | 1,102        |
| Cambridge.....                                | S. K. & W. R. R.....         | 1,248        |
| Canton.....                                   | A., T. & S. F. R. R.....     | 1,582        |
| Carbon.....                                   | K. C. R. R.....              | 952          |
| Carbondale.....                               | A., T. & S. F. R. R.....     | 1,072        |
| Carbon Hill.....                              | L. & S. W. R. R.....         | 1,122        |
| Carlisle.....                                 | A., T. & S. F. R. R.....     | 3,178        |
| Carlyle.....                                  | K. C., L. & S. R. R.....     | 984          |
| Carthage.....                                 | A., T. & S. F. R. R.....     | 5,009        |
| Cedar Grove.....                              | A., T. & S. F. R. R.....     | 1,237        |
| Do. June.....                                 | A., T. & S. F. R. R.....     | 778          |
| Centralia.....                                | U. P. R. R.....              | 1,270        |
| Chanute.....                                  | K. C., L. & S. R. R.....     | 910          |
| Do. June. L. L. & G. R. R.....                | M., K. & T. R. R.....        | 914          |
| Chase.....                                    | A., T. & S. F. R. R.....     | 1,708        |
| Cherokee.....                                 | K. C., Ft. S. & G. R. R..... | 933          |
| Cherryvale.....                               | K. C., L. & S. R. R.....     | 836          |
| Chetopa.....                                  | M., K. & T. R. R.....        | 832          |
| Chirley Camp.....                             | Toner.....                   | 2,106        |
| Choteau.....                                  | A., T. & S. F. R. R.....     | 764          |
| Cicero.....                                   | A., T. & S. F. R. R.....     | 1,306        |
| Cimarron.....                                 | A., T. & S. F. R. R.....     | 2,116        |
| Circleville.....                              | St. J. & D. C. R. R.....     | 1,116        |
| Clarksburgh.....                              | Ft. S., S. E. & M. R. R..... | 890          |
| Clay Center.....                              | J. C., & Ft. K. R. R.....    | 1,201        |
| Cleveland.....                                | K. P. R. R.....              | 3,046        |
| Clifton.....                                  | J. C., & Ft. K. R. R.....    | 1,278        |
| Climax.....                                   | A., T. & S. F. R. R.....     | 1,018        |
| Clinton.....                                  | Toner.....                   | 762          |
| Clyde.....                                    | J. C. & Ft. K. R. R.....     | 1,299        |
| Coal Creek.....                               | Soloman R. R.....            | 1,197        |
| Coal Vale.....                                | Ft. S., S. E. & M. R. R..... | 832          |
| Coffeyville.....                              | K. C., L. & S. R. R.....     | 728          |
| Collyer.....                                  | K. P. R. R.....              | 2,586        |
| Colony, divide between Kan. & Ark. River..... | K. C., L. & S. R. R.....     | 1,121        |
| Columbus.....                                 | K. C., Ft. S. & G. R. R..... | 905          |
| Concordia.....                                | J. C. & Ft. K. R. R.....     | 1,366        |
| Conway.....                                   | A., T. & S. F. R. R.....     | 1,527        |
| Coolidge.....                                 | A., T. & S. F. R. R.....     | 3,339        |
| Corning.....                                  | U. P. R. R.....              | 1,369        |
| Council Grove.....                            | M., K. & T. R. R.....        | 1,238        |
| Crane.....                                    | S. K. & W. R. R.....         | 763          |
| Crawford.....                                 | A., T. & S. F. R. R.....     | 1,220        |
| Cummings.....                                 | A., T. & S. F. R. R.....     | 981          |
| Deerfield.....                                | A., T. & S. F. R. R.....     | 2,933        |
| Delphos.....                                  | Soloman R. R.....            | 1,301        |
| Derby.....                                    | A., T. & S. F. R. R.....     | 1,271        |
| De Soto.....                                  | A., T. & S. F. R. R.....     | 790          |
| Detroit.....                                  | K. P. R. R.....              | 1,135        |
| Dodge City.....                               | A., T. & S. F. R. H.....     | 2,475        |
| Do. Signal Station.....                       | U. S. Signal Office.....     | 2,512        |
| Dorrance.....                                 | K. P. R. R.....              | 1,730        |
| Douglas.....                                  | A., T. & S. F. R. R.....     | 1,194        |
| Dundee.....                                   | A., T. & S. F. R. R.....     | 1,895        |
| Eagle Creek.....                              | A., T. & S. F. R. R.....     | 1,188        |
| Eagle Tail.....                               | K. P. R. R.....              | 3,434        |
| Easelton.....                                 | K. C., L. & S. R. R.....     | 960          |
| Easton.....                                   | K. C. R. R.....              | 909          |
| Edgerton.....                                 | K. C., L. & S. R. R.....     | 962          |
| Edwardsville.....                             | K. P. R. R.....              | 783          |
| Effingham.....                                | U. P. R. R.....              | 1,144        |
| Eldorado.....                                 | A., T. & S. F. R. R.....     | 1,282        |
| Elk.....                                      | K. C. R. R.....              | 979          |
| Ellinor.....                                  | A., T. & S. F. R. R.....     | 1,154        |

| Station.                            | Authority.                    | Elevation.   |
|-------------------------------------|-------------------------------|--------------|
|                                     |                               | <i>Feet.</i> |
| Ellinwood .....                     | A., T. & S. F. R. R .....     | 1,780        |
| Ellis .....                         | K. P. R. R .....              | 2,117        |
| Ellsworth .....                     | K. P. R. R .....              | 1,538        |
| Elmdale .....                       | A., T. & S. F. R. R .....     | 1,193        |
| Elmwood .....                       | Toner .....                   | 775          |
| Emporia .....                       | A., T. & S. F. R. R .....     | 1,132        |
| Do.. Junction M., K. & T. ....      | A., T. & S. F. R. R .....     | 1,132        |
| Eakridge .....                      | A., T. & S. F. R. R .....     | 1,403        |
| Endora .....                        | A., T. & S. F. R. R .....     | 811          |
| Eureka .....                        | A., T. & S. F. R. R .....     | 1,073        |
| Fairfield .....                     | A., T. & S. F. R. R .....     | 1,060        |
| Fairmont .....                      | K. P. R. R .....              | 955          |
| Fall Leaf .....                     | K. P. R. R .....              | 809          |
| Farlington .....                    | K. C., Ft. S. & G. R. R ..... | 988          |
| Do .....                            | A. & N. R. R .....            | 914          |
| Florence .....                      | A., T. & S. F. R. R .....     | 1,260        |
| Fontana .....                       | K. C., Ft. S. & G. R. R ..... | 928          |
| Frankfort .....                     | U. P. R. R .....              | 1,155        |
| Fullerton .....                     | A., T. & S. F. R. R .....     | 1,091        |
| Fulton .....                        | K. C., Ft. S. & G. R. R ..... | 813          |
| Galcsburg .....                     | M., K. & T. R. R .....        | 979          |
| Galoa .....                         | A., T. & S. F. R. R .....     | 1,537        |
| Garden City .....                   | A., T. & S. F. R. R .....     | 2,827        |
| Gardner .....                       | Smithsonian Inst .....        | 800          |
| Garfield .....                      | A., T. & S. F. R. R .....     | 2,066        |
| Garnett .....                       | K. C., L. & S. R. R .....     | 1,056        |
| Girard .....                        | K. C., Ft. S. & G. R. R ..... | 990          |
| Glasco .....                        | Solomon R. R .....            | 1,321        |
| Glendale .....                      | A., T. & S. F. R. R .....     | 849          |
| Godfrey .....                       | K. C., Ft. S. & G. R. R ..... | 962          |
| Gopher .....                        | K. P. R. R .....              | 3,319        |
| Gorham .....                        | K. P. R. R .....              | 1,912        |
| Grainfield .....                    | K. P. R. R .....              | 2,811        |
| Grantville .....                    | K. P. R. R .....              | 877          |
| Grasshopper Falls .....             | K. C. R. R .....              | 917          |
| Great Bend .....                    | A., T. & S. F. R. R .....     | 1,841        |
| Greenleaf .....                     | U. P. R. R .....              | 1,462        |
| Green Ridge .....                   | Toner .....                   | 1,013        |
| Grenola .....                       | S. K. & W. R. R .....         | 1,112        |
| Grinnell .....                      | K. P. R. R .....              | 2,904        |
| Half Mound .....                    | K. C. R. R .....              | 979          |
| Halstead Junction, H. C. R. R. .... | A., T. & S. F. R. R .....     | 1,386        |
| Hamlin .....                        | St. J. & D. C. R. R .....     | 983          |
| Hanover .....                       | St. J. & D. C. R. R .....     | 1,228        |
| Harker, Fort .....                  | K. P. R. R .....              | 1,562        |
| Hartford .....                      | M., K. & T. R. R .....        | 1,087        |
| Hartland .....                      | A., T. & S. F. R. R .....     | 3,047        |
| Hawesville .....                    | A., T. & S. F. R. R .....     | 1,104        |
| Hayes .....                         | K. P. R. R .....              | 1,991        |
| Hazleton .....                      | K. P. R. R .....              | 1,114        |
| Hepler .....                        | M., K. & T. R. R .....        | 1,002        |
| Hevels .....                        | M., K. & C. R. R .....        | 914          |
| Hiattsville .....                   | M., K. & T. R. R .....        | 1,003        |
| Hiawatha .....                      | St. J. & D. C. R. R .....     | 1,094        |
| Highland .....                      | A. & N. R. R .....            | 893          |
| Hillsboro' .....                    | A., T. & S. F. R. R .....     | 1,424        |
| Hilldale .....                      | K. C., Ft. S. & G. R. R ..... | 903          |
| Hoge .....                          | K. P. R. R .....              | 854          |
| Hollenburgh .....                   | St. J. & D. C. R. R .....     | 1,259        |
| Holliday .....                      | A., T. & S. F. R. R .....     | 753          |
| Holton .....                        | K. C. R. R .....              | 1,026        |
| Homer .....                         | K. P. R. R .....              | 1,874        |
| Horners .....                       | A., T. & S. F. R. R .....     | 1,314        |
| Horton .....                        | A., T. & S. F. R. R .....     | 1,186        |

| Station.                                 | Authority.                   | Elevation.   |
|------------------------------------------|------------------------------|--------------|
|                                          |                              | <i>Feet.</i> |
| Howard.....                              | A., T. & S. F. R. R.....     | 1,006        |
| Howell.....                              | A., T. & S. F. R. R.....     | 2,535        |
| Hugo.....                                | Toner.....                   | 4,937        |
| Humboldt.....                            | K. C., L. & L. R. R.....     | 952          |
| Hunds Station.....                       | K. C. R. R.....              | 835          |
| Hunnewell.....                           | Sumner Co. R. R.....         | 1,102        |
| Hutchinson.....                          | A., T. & S. F. R. R.....     | 1,524        |
| Independence.....                        | K. C., L. & S. R. R.....     | 794          |
| Iola.....                                | K. C., L. & S. R. R.....     | 955          |
| Irving.....                              | U. P. R. R.....              | 1,152        |
| Junction City.....                       | K. P. R. R.....              | 1,082        |
| Kansas Falls.....                        | K. P. R. R.....              | 1,106        |
| Kent.....                                | A., T. & S. F. R. R.....     | 1,491        |
| Kingsley.....                            | A., T. & S. F. R. R.....     | 2,162        |
| Kingsville.....                          | K. P. R. R.....              | 920          |
| Labette.....                             | M., K. & T. R. R.....        | 864          |
| La Cygne.....                            | K. C., Ft. S. & G. R. R..... | 825          |
| Ladore.....                              | M., K. & T. C. R.....        | 909          |
| Lakeview.....                            | A., T. & S. F. R. R.....     | 628          |
| Lakin.....                               | A., T. & S. F. R. R.....     | 2,969        |
| Larkins.....                             | K. C. R. R.....              | 944          |
| Larned.....                              | A., T. & S. F. R. R.....     | 1,993        |
| Larned, Fort.....                        | Med. Dept., U. S. A.....     | 1,932        |
| Laura.....                               | A., T. & S. F. R. R.....     | 1,638        |
| Lawrence.....                            | A., T. & S. F. R. R.....     | 849          |
| Do..... K. P. crossing.....              | A., T. & S. F. R. R.....     | 822          |
| Leavenworth.....                         | K. P. R. R.....              | 765          |
| Do..... Junction M. P. R. R.....         | A., T. & S. F. R. R.....     | 764          |
| Do..... Fort.....                        | Med. Dept., U. S. A.....     | 896          |
| Do..... Signal Station.....              | U. S. Signal Office.....     | 842          |
| Lecompton.....                           | A. T. & S. F. R. R.....      | 844          |
| Do.....                                  | Smithsonian Inst.....        | 825          |
| Lehigh.....                              | A., T. & S. F. R. R.....     | 1,520        |
| Le Loup.....                             | K. C., L. & S. R. R.....     | 949          |
| Lenape.....                              | K. P. R. R.....              | 781          |
| Lenexa.....                              | K. C., Ft. S. & G. R. R..... | 1,050        |
| Le Roy.....                              | M., K. & T. R. R.....        | 994          |
| Liberty.....                             | K. C., L. & S. R. R.....     | 744          |
| Lindsborg.....                           | S. & S. W. R. R.....         | 1,332        |
| Linwood.....                             | K. P. R. R.....              | 789          |
| Little River.....                        | A., T. & S. F. R. R.....     | 1,572        |
| Longton.....                             | S. K. & W. R. R.....         | 919          |
| Loring.....                              | K. P. R. R.....              | 789          |
| Louisville.....                          | St. J. & D. C. R. R.....     | 1,006        |
| Lowell.....                              | S. C. & J. R. R.....         | 823          |
| Lyons.....                               | A., T. & S. F. R. R.....     | 1,691        |
| McCune.....                              | M., K. & C. R. R.....        | 924          |
| McIntosh.....                            | A., T. & S. F. R. R.....     | 1,125        |
| McLouth.....                             | A., T. & S. F. R. R.....     | 1,157        |
| McPherson.....                           | A., T. & S. F. R. R.....     | 1,488        |
| Madison.....                             | A., T. & S. F. R. R.....     | 1,068        |
| Manhattan Junction, K. P. R. R.....      | A., T. & S. F. R. R.....     | 1,000        |
| Manville.....                            | St. J. & D. C. R. R.....     | 972          |
| Marion Center.....                       | A., T. & S. F. R. R.....     | 1,200        |
| Marmaton.....                            | M., K. & T. R. R.....        | 917          |
| Marysville.....                          | St. J. & D. C. R. R.....     | 1,156        |
| Mathewson.....                           | M., K. & C. R. R.....        | 853          |
| Medina.....                              | K. P. R. R.....              | 853          |
| Medway.....                              | A., T. & S. F. R. R.....     | 3,284        |
| Memphis.....                             | Ft. S., S. E. & M. R. R..... | 843          |
| Menoken.....                             | K. P. R. R.....              | 902          |
| Meriden.....                             | A., T. & S. F. R. R.....     | 964          |
| Do..... Junction.....                    | A., T. & S. F. R. R.....     | 945          |
| Do..... crossing L. S. & S. T. R. R..... | A., T. & S. F. R. R.....     | 976          |

| Station.                                | Authority.                    | Elevation.   |
|-----------------------------------------|-------------------------------|--------------|
|                                         |                               | <i>Fest.</i> |
| Milford .....                           | J. C. & Ft. K. R. R. ....     | 1,112        |
| Minneapolis .....                       | Solomon R. R. ....            | 1,257        |
| Mitchell .....                          | A., T. & S. F. R. R. ....     | 1,731        |
| Moline .....                            | S. K. & W. R. R. ....         | 1,050        |
| Monmouth .....                          | M., K. & C. R. R. ....        | 881          |
| Monotony .....                          | K. P. R. R. ....              | 3,774        |
| Monrovia .....                          | U. P. R. R. ....              | 1,054        |
| Monument .....                          | K. P. R. R. ....              | 3,181        |
| Moore .....                             | K. P. R. R. ....              | 915          |
| Morehead .....                          | K. C., L. & L. R. R. ....     | 900          |
| Morganville .....                       | J. C. & F. K. R. R. ....      | 1,238        |
| Morse .....                             | A., T. & S. F. R. R. ....     | 1,085        |
| Mount Zion .....                        | K. P. R. R. ....              | 1,654        |
| Mulvane .....                           | A., T. & S. F. R. R. ....     | 1,065        |
| Muncy Siding .....                      | K. P. R. R. ....              | 767          |
| Muscotah .....                          | U. P. R. R. ....              | 973          |
| Neosho Falls .....                      | M., K. & T. R. R. ....        | 980          |
| Neosho Rapids .....                     | M., K. & T. R. R. ....        | 1,076        |
| Netawaka .....                          | St. J. & D. C. R. R. ....     | 1,140        |
| Nettleton .....                         | A., T. & S. F. R. R. ....     | 2,112        |
| Neutral .....                           | K. C., Ft. S. & G. R. R. .... | 862          |
| New Cambria .....                       | K. P. R. R. ....              | 1,189        |
| Newman .....                            | K. P. R. R. ....              | 861          |
| New Salem .....                         | S. K. & W. R. R. ....         | 1,242        |
| Newton .....                            | A., T. & S. F. R. R. ....     | 1,438        |
| Nichols .....                           | A., T. & S. F. R. R. ....     | 1,001        |
| Nickerson .....                         | A., T. & S. F. R. R. ....     | 1,592        |
| North Topeka, K. P. crossing .....      | A., T. & S. F. R. R. ....     | 872          |
| North Robinson .....                    | St. J. & D. C. R. R. ....     | 949          |
| North Wichita .....                     | A., T. & S. F. R. R. ....     | 1,294        |
| Do .....                                | A., T. & S. F. R. R. ....     | 1,302        |
| Do .....                                | A., T. & S. F. R. R. ....     | 1,158        |
| Nortonville .....                       | A., T. & S. F. R. R. ....     | 1,158        |
| Norway .....                            | St. J. & D. C. R. R. ....     | 1,041        |
| Norwood .....                           | K. C., L. & S. R. R. ....     | 938          |
| Ochiltree .....                         | K. C., Ft. S. & G. R. R. .... | 1,078        |
| Offerle .....                           | A., T. & S. F. R. R. ....     | 2,261        |
| Ogallah .....                           | K. P. R. R. ....              | 2,367        |
| Ogdenburg .....                         | K. P. R. R. ....              | 1,060        |
| Olathe .....                            | A., T. & S. F. R. R. ....     | 1,030        |
| Osage .....                             | A., T. & S. F. R. R. ....     | 1,075        |
| Osage Mission .....                     | M., K. & T. R. R. ....        | 890          |
| Oswakee .....                           | A., T. & S. F. R. R. ....     | 876          |
| Oskaloosa .....                         | A., T. & S. F. R. R. ....     | 969          |
| Oswego .....                            | M., K. & T. R. R. ....        | 895          |
| Ottawa, Marias des Cygnes River .....   | K. C., L. & S. R. R. ....     | 896          |
| Oxford .....                            | S. K. & W. R. R. ....         | 1,160        |
| Paola .....                             | K. C., Ft. S. & G. R. R. .... | 854          |
| Pardee .....                            | Toner .....                   | 1,155        |
| Parker .....                            | Toner .....                   | 921          |
| Parkersville .....                      | M., K. & T. R. R. ....        | 1,337        |
| Parnell .....                           | A., T. & S. F. R. R. ....     | 1,039        |
| Parsons Junction, Neosho Division ..... | M., K. & T. R. R. ....        | 902          |
| Pauline .....                           | A., T. & S. F. R. R. ....     | 1,027        |
| Pavilion .....                          | A., T. & S. F. R. R. ....     | 1,096        |
| Pawnee .....                            | K. C., Ft. S. & G. R. R. .... | 988          |
| Pawnee Rock .....                       | A., T. & S. F. R. R. ....     | 1,939        |
| Paw Paw .....                           | A., T. & S. F. R. R. ....     | 1,110        |
| Peabody .....                           | A., T. & S. F. R. R. ....     | 1,349        |
| Peace .....                             | Toner .....                   | 1,613        |
| Perry .....                             | Ft. S., S. E. & M. R. R. .... | 799          |
| Perryville .....                        | K. P. R. R. ....              | 852          |
| Perth .....                             | A., T. & S. F. R. R. ....     | 1,201        |
| Petersburgh .....                       | Toner .....                   | 2,224        |
| Peterton .....                          | A., T. & S. F. R. R. ....     | 1,065        |

| Station.                                        | Authority.                   | Elevation.   |
|-------------------------------------------------|------------------------------|--------------|
|                                                 |                              | <i>Feet.</i> |
| Philips.....                                    | A., T. & S. F. R. R.....     | 1,123        |
| Pierceville.....                                | A., T. & S. F. R. R.....     | 2,750        |
| Pilot Knob.....                                 | K. P. R. R.....              | 945          |
| Pleasant Hill Junction, with Mo. Pac. R. R..... | A., T. & S. F. R. R.....     | 849          |
| Pleasanton.....                                 | K. C., Ft. S. & G. R. R..... | 860          |
| Pleasant Ridge.....                             | K. C. R. R.....              | 1,066        |
| Plymouth.....                                   | A., T. & S. F. R. R.....     | 1,135        |
| Prairie City.....                               | K. C., L. & S. R. R.....     | 1,052        |
| Prescott.....                                   | K. C., Ft. S. & G. R. R..... | 887          |
| Princeton.....                                  | K. C., L. & S. R. R.....     | 966          |
| Raymond.....                                    | A., T. & S. F. R. R.....     | 1,721        |
| Raymore.....                                    | A., T. & S. F. R. R.....     | 1,097        |
| Readings.....                                   | A., T. & S. F. R. R.....     | 1,073        |
| Red Vermillion.....                             | St. J. & D. C. R. R.....     | 1,046        |
| Reno.....                                       | K. P. R. R.....              | 835          |
| Richland.....                                   | L. & S. W. R. R.....         | 901          |
| Richmond.....                                   | K. C., L. & S. R. R.....     | 1,017        |
| Ridgeway.....                                   | A., T. & S. F. R. R.....     | 2,514        |
| Ridgway.....                                    | Toner.....                   | 903          |
| Riley, Fort.....                                | K. P. R. R.....              | 1,072        |
| Rock Creek.....                                 | A., T. & S. F. R. R.....     | 1,057        |
| Rome.....                                       | S. C. R. R.....              | 1,216        |
| Rossville.....                                  | K. P. R. R.....              | 933          |
| Russell.....                                    | K. P. R. R.....              | 1,832        |
| Ryan.....                                       | St. J. & D. C. R. R.....     | 892          |
| Sabetha.....                                    | St. J. & D. C. R. R.....     | 1,308        |
| Safford.....                                    | A., T. & S. F. R. R.....     | 1,140        |
| Saint Francis.....                              | Toner.....                   | 906          |
| Saint George.....                               | K. P. R. R.....              | 1,000        |
| Saint Marys.....                                | K. P. R. R.....              | 955          |
| Salem.....                                      | K. P. R. R.....              | 1,558        |
| Salina.....                                     | K. P. R. R.....              | 1,225        |
| Sand Spring.....                                | K. P. R. R.....              | 1,146        |
| Sargent.....                                    | Toner.....                   | 3,425        |
| Scott, Fort.....                                | M., K. & T. R. R.....        | 802          |
| Scotts.....                                     | K. C. R. R.....              | 1,025        |
| Scranton.....                                   | A., T. & S. F. R. R.....     | 1,099        |
| Sedgwick Junction, with H. C. R. R.....         | A., T. & S. F. R. R.....     | 1,369        |
| Sedgwick City.....                              | A., T. & S. F. R. R.....     | 1,368        |
| Seely.....                                      | A., T. & S. F. R. R.....     | 1,162        |
| Seneca.....                                     | St. J. & D. C. R. R.....     | 1,154        |
| Severance.....                                  | St. J. & D. C. R. R.....     | 902          |
| Severy.....                                     | A., T. & S. F. R. R.....     | 1,098        |
| Sheelock.....                                   | A., T. & S. F. R. R.....     | 2,876        |
| Sheridan.....                                   | K. P. R. R.....              | 3,103        |
| Sherlock.....                                   |                              | 2,925        |
| Short Creek.....                                | S. C. & J. R. R.....         | 893          |
| Sibley.....                                     | K. C., L. & S. R. R.....     | 817          |
| Sidney.....                                     | A., T. & S. F. R. R.....     | 2,785        |
| Sigel.....                                      |                              | 753          |
| Silica.....                                     |                              | 1,779        |
| Silver Lake.....                                | K. P. R. R.....              | 915          |
| Skiddy.....                                     | M., K. & T. R. R.....        | 1,226        |
| Soloman City.....                               | Solomon R. R.....            | 1,175        |
| Do... Junction.....                             | Solomon R. R.....            | 1,172        |
| Sother.....                                     | U. P. R. R.....              | 1,179        |
| South Haven.....                                | S. C. R. R.....              | 1,124        |
| South Mound.....                                | M., K. & T. R. R.....        | 993          |
| Spearville.....                                 | A., T. & S. F. R. R.....     | 2,449        |
| Spencer.....                                    | A., T. & S. F. R. R.....     | 859          |
| Springdale.....                                 | A., T. & S. F. H. R.....     | 1,032        |
| Spring Hill.....                                | K. C., Ft. S. & G. R. R..... | 1,028        |
| Stanley.....                                    | A., T. & S. F. R. R.....     | 973          |
| Steel City.....                                 |                              | 1,277        |

| Station.                                      | Authority.                   | Elevation.   |
|-----------------------------------------------|------------------------------|--------------|
|                                               |                              | <i>Feet.</i> |
| Sterling.....                                 | A., T. & S. F. R. R.....     | 1,635        |
| Stilson.....                                  | K. C., Ft. S. & G. R. R..... | 909          |
| Strawn.....                                   | M., K. & T. R. R.....        | 1,047        |
| Strong City.....                              | A., T. & S. F. R. R.....     | 1,172        |
| Summit "Santa Fe Ridge".....                  | K. C., L. & S. R. R.....     | 1,068        |
| Syracuse.....                                 | A., T. & S. F. R. R.....     | 3,218        |
| Tecumseh.....                                 | A., T. & S. F. R. R.....     | 860          |
| Terra Cotta.....                              | K. P. R. R.....              | 1,470        |
| Thayer.....                                   | K. C., L. & S.....           | 1,445        |
| Tiblow.....                                   | K. P. R. R.....              | 793          |
| Tonganoxie.....                               | K. P. R. R.....              | 851          |
| Topeka.....                                   | A., T. & S. F. R. R.....     | 884          |
| Troy.....                                     | St. J. & D. C. R. R.....     | 1,091        |
| Do. Junction.....                             | A. & W. R. R.....            | 1,150        |
| Turner.....                                   | A., T. & S. F. R. R.....     | 762          |
| Udall.....                                    | A., T. & S. F. R. R.....     | 1,272        |
| Urbana.....                                   | M., K. & T. R. R.....        | 931          |
| Valley Center.....                            | A., T. & S. F. R. R.....     | 1,339        |
| Valley Falls Junction, Kansas Cent. R. R..... | A., T. & S. F. R. R.....     | 907          |
| Vermillion.....                               | U. P. R. R.....              | 1,198        |
| Victoria.....                                 | K. P. R. R.....              | 1,928        |
| Vinland.....                                  | K. C., L. & S. R. R.....     | 881          |
| Wabaunsee.....                                | A., T. & S. F. R. R.....     | 1,011        |
| Wakarusa.....                                 | A., T. & S. F. R. R.....     | 946          |
| Wa Keeney.....                                | K. P. R. R.....              | 2,456        |
| Wakefield.....                                | J. C. & Ft. R. R. R.....     | 1,152        |
| Walker.....                                   | K. P. R. R.....              | 1,944        |
| Wallace.....                                  | K. P. R. R.....              | 3,301        |
| Walnut.....                                   | M., K. & T. R. R.....        | 931          |
| Walnut Ridge.....                             | A., T. & S. F. R. R.....     | 1,199        |
| Walthena.....                                 | St. J. & D. C. R. R.....     | 816          |
| Walton.....                                   | A., T. & S. F. R. R.....     | 1,527        |
| Wamego.....                                   | K. P. R. R.....              | 1,000        |
| Washington.....                               | St. J. & D. C. R. R.....     | 1,316        |
| Waterville.....                               | U. P. R. R.....              | 1,183        |
| Weir City.....                                | M., K. & C. R. R.....        | 921          |
| Welda.....                                    | K. C., L. & S. R. R.....     | 1,098        |
| Wellington.....                               | A., T. & S. F. R. R.....     | 1,219        |
| Wellsville.....                               | K. C., L. & S. R. R.....     | 1,041        |
| Wetmore.....                                  | U. P. R. R.....              | 1,153        |
| White City.....                               | M., K. & T. R. R.....        | 1,476        |
| White Cloud.....                              | A. & N. R. R.....            | 858          |
| Whiting.....                                  | U. P. R. R.....              | 1,126        |
| Wichita.....                                  | A., T. & S. F. R. R.....     | 1,291        |
| Wilder.....                                   | A., T. & S. F. R. R.....     | 770          |
| Williamstown.....                             | K. P. R. R.....              | 851          |
| Wilson.....                                   | K. P. R. R.....              | 1,684        |
| Winchester.....                               | K. C. R. R.....              | 1,164        |
| Winfield.....                                 | A., T. & S. F. R. R.....     | 1,112        |
| Wolf River Crossing.....                      | St. J. & D. C. R. R.....     | 819          |
| Wyandotte.....                                | Smithsonian Inst.....        | 707          |
| Zarah, Fort.....                              | .....                        | 1,870        |

# KENTUCKY.

| Station.                                | Authority.                     | Elevation.   |
|-----------------------------------------|--------------------------------|--------------|
|                                         |                                | <i>Feet.</i> |
| Aden .....                              | C. & O. R. R. ....             | 626          |
| Allensville .....                       | L., N. S. & N. A. R. R. ....   | 552          |
| Alma House .....                        | L., N. S. & N. A. R. R. ....   | 425          |
| Ashland .....                           | C. & O. R. R. ....             | 544          |
| Athens .....                            | C. & O. R. R. ....             | 1,006        |
| Auburn .....                            | L., N. S. & N. A. R. R. ....   | 603          |
| Bacon Creek .....                       | L., N. S. & N. A. R. R. ....   | 619          |
| Bakersport .....                        | Paducah & E. R. R. ....        | 477          |
| Bank Lick .....                         | L., C. & L. R. R. ....         | 837          |
| Bardstown .....                         | L., N. S. & N. A. R. R. ....   | 635          |
| Do .... Junction .....                  | L. N. S. & N. A. R. R. ....    | 415          |
| Beaver Dam .....                        | Paducah & E. R. R. ....        | 492          |
| Belmont .....                           | L., N. S. & N. A. R. R. ....   | 429          |
| Bethlehem .....                         | L., N. S. & N. A. R. R. ....   | 730          |
| Big Clifty .....                        | Paducah & E. R. R. ....        | 733          |
| Big Spring .....                        | L., N. S. & N. R. R. ....      | 512          |
| Bishops .....                           | C. S. R. R. ....               | 887          |
| Blanchet .....                          | C. S. R. R. ....               | 968          |
| Booth's .....                           | L., N. S. & N. A. R. R. ....   | 423          |
| Boston .....                            | L., N. S. & N. A. R. R. ....   | 429          |
| Bowling Green .....                     | L., N. S. & N. A. R. R. ....   | 466          |
| Bracht .....                            | C. S. R. R. ....               | 934          |
| Bridge Fork .....                       | C. S. R. R. ....               | 1,318        |
| Bristow .....                           | L., N. S. & N. A. R. R. ....   | 515          |
| Brodhead .....                          | L., N. S. & N. A. R. R. ....   | 901          |
| Brooks .....                            | L., N. S. & N. A. R. R. ....   | 488          |
| Brumfield .....                         | L., N. S. & N. A. R. R. ....   | 1,012        |
| Burgin .....                            | C. S. R. R. ....               | 902          |
| Cadentown .....                         | C. & O. R. R. ....             | 1,034        |
| Calvert City .....                      | Paducah & E. R. R. ....        | 494          |
| Campbellsburgh .....                    | L., C. & L. R. R. ....         | 904          |
| Cane Spring .....                       | L., N. S. & N. A. R. R. ....   | 621          |
| Caneyville .....                        | Paducah & E. R. R. ....        | 450          |
| Carrolton .....                         | L., C. & L. R. R. ....         | 472          |
| Catlettsburg .....                      | C. & O. R. R. ....             | 544          |
| Catnip Hill .....                       | C. S. R. R. ....               | 990          |
| Cave City .....                         | L., N. S. & N. A. R. R. ....   | 611          |
| Cave Spring .....                       | L., N. S. & N. A. R. R. ....   | 586          |
| Cayce .....                             | M. & O. R. R. ....             | 400          |
| Cecilia .....                           | Paducah & E. R. R. ....        | 688          |
| Cecilian Junction .....                 | L., N. S. & N. A. R. R. ....   | 675          |
| Cedar Grove .....                       | C. S. R. R. ....               | 851          |
| Chicago .....                           | L., N. S. & N. A. R. R. ....   | 671          |
| Cincinnati and Lexington Junction ..... | L., N. S. & N. A. R. R. ....   | 435          |
| Clinton .....                           | M. & O. R. R. ....             | 321          |
| Colby .....                             | C. & O. R. R. ....             | 1,023        |
| Colesburgh .....                        | L., N. S. & N. A. R. ....      | 423          |
| Columbia .....                          | St. L., I. Mt. & S. R. R. .... | 313          |
| Columbus .....                          | M. & O. R. R. ....             | 309          |
| Combs Ferry .....                       | E., L. & B. S. R. R. ....      | 954          |
| Corinth .....                           | C. S. R. R. ....               | 968          |
| Crab Orchard .....                      | L., N. S. & N. A. R. R. ....   | 917          |
| Crittenden .....                        | C. S. R. R. ....               | 923          |
| Cumberland Falls .....                  | C. S. R. R. ....               | 1,260        |
| Danville .....                          | C. S. R. R. ....               | 970          |
| Dixon .....                             | C. S. R. R. ....               | 936          |
| Donerail .....                          | C. S. R. R. ....               | 897          |
| Dry Ridge .....                         | C. S. R. R. ....               | 964          |

| Station.                                  | Authority.                   | Elevation.   |
|-------------------------------------------|------------------------------|--------------|
|                                           |                              | <i>Fect.</i> |
| Dulaney .....                             | Paducah & E. R. R. ....      | 684          |
| Duncannon .....                           | L., N. S. & N. A. R. R. .... | 987          |
| Eagle .....                               | L., C. & L. R. R. ....       | 473          |
| Earlington .....                          | E., H. & N. R. R. ....       | 370          |
| East Kentucky Junction .....              | C. & O. R. R. ....           | 613          |
| East View .....                           | Paducah & E. R. R. ....      | 812          |
| Eddyville .....                           | Paducah & E. R. R. ....      | 487          |
| Elizabethtown .....                       | L., N. S. & N. A. R. R. .... | 681          |
| Elleston .....                            | L., C. & L. R. R. ....       | 593          |
| Elm Lick .....                            | Paducah & E. R. R. ....      | 507          |
| Enterprise .....                          | C. & O. R. R. ....           | 831          |
| Erlanger .....                            | C. S. R. R. ....             | 915          |
| Eubanks .....                             | C. S. R. R. ....             | 1,187        |
| Ewington .....                            | C. & O. R. R. ....           | 992          |
| Farmers .....                             | C. & O. R. R. ....           | 668          |
| Flat Rock .....                           | C. S. R. R. ....             | 1,309        |
| Franklin .....                            | L., N. S. & N. A. R. R. .... | 689          |
| Gates .....                               | C. & O. R. R. ....           | 819          |
| Georgetown .....                          | C. S. R. R. ....             | 883          |
| Gethsemane .....                          | L., N. S. & N. A. R. R. .... | 456          |
| Gilberts Creek .....                      | L., N. S. & N. A. R. R. .... | 828          |
| Gilbertsville .....                       | Paducah & E. R. R. ....      | 482          |
| Glasgow .....                             | L., N. S. & N. A. R. R. .... | 778          |
| Do Junction .....                         | L., N. S. & N. A. R. R. .... | 621          |
| Glencoe .....                             | L., C. & L. R. R. ....       | 550          |
| Glendale .....                            | L., N. S. & N. A. R. R. .... | 638          |
| Gordon .....                              | Paducah & E. R. R. ....      | 480          |
| Gravel Switch .....                       | L., N. S. & N. A. R. R. .... | 894          |
| Grayson Springs Station .....             | Paducah & E. R. R. ....      | 709          |
| Grear Coal Mines .....                    | C. S. R. R. ....             | 1,325        |
| Greendale .....                           | C. S. R. R. ....             | 957          |
| Green River .....                         | C. S. R. R. ....             | 927          |
| Greenville .....                          | Paducah & E. R. R. ....      | 537          |
| Greenwood .....                           | C. S. R. R. ....             | 1,207        |
| Gum Sulphur .....                         | L., N. S. & N. A. R. R. .... | .....        |
| Guthrie .....                             | L., N. S. & N. A. R. R. .... | 525          |
| Do Crossing L. & M. R. R. ....            | E., H. & N. R. R. ....       | 545          |
| Hadensville .....                         | L., N. S. & N. A. R. R. .... | 532          |
| Hall's Gap .....                          | L., N. S. & N. A. R. R. .... | 991          |
| Hamilton .....                            | Paducah & E. R. R. ....      | 493          |
| Harris .....                              | L., N. S. & N. A. R. R. .... | 1,007        |
| Harrodsburgh Junction .....               | C. S. R. R. ....             | 915          |
| Hatden's .....                            | L., N. S. & N. A. R. R. .... | 821          |
| Hedges .....                              | C. & O. R. R. ....           | 976          |
| Henderson, L. W. in Ohio River .....      | E., H. & N. R. R. ....       | 335          |
| Do top of bank on railroad terminus ..... | E., H. & N. R. R. ....       | 402          |
| Herat .....                               | E., L. & B. S. R. R. ....    | 619          |
| Hickman .....                             | N. & N. R. R. ....           | 301          |
| High Bridge .....                         | C. S. R. R. ....             | 777          |
| Hinton .....                              | C. S. R. R. ....             | 958          |
| Hopkinsville .....                        | E., H. & N. R. R. ....       | 550          |
| Horse Branch .....                        | Paducah & E. R. R. ....      | 527          |
| Do tunnel, surface .....                  | Paducah & E. R. R. ....      | 782          |
| Horse Cave .....                          | L., N. S. & N. A. R. R. .... | 601          |
| Hubers .....                              | L., N. S. & N. A. R. R. .... | 456          |
| Hyattsville .....                         | L., N. S. & N. A. R. R. .... | 1,002        |
| Independence .....                        | L., C. & L. R. R. ....       | 760          |
| Jessamine .....                           | C. S. R. R. ....             | 901          |
| Jordan .....                              | M. & O. R. R. ....           | 404          |
| Junction .....                            | E., L. & B. S. R. R. ....    | 618          |
| Junction City .....                       | C. S. R. R. ....             | 997          |
| Kelly's Station .....                     | E., H. & N. R. R. ....       | 705          |
| Kenton Heights .....                      | C. S. R. R. ....             | 845          |
| King's Mountain .....                     | C. S. R. R. ....             | 1,183        |



| Station.                              | Authority.                   | Elevation.   |
|---------------------------------------|------------------------------|--------------|
|                                       |                              | <i>Feet.</i> |
| Kinkaid .....                         | C. S. R. R. ....             | 877          |
| Kuttawa .....                         | Paducah & E. R. R. ....      | 487          |
| La Grange .....                       | L., C. & L. R. R. ....       | 860          |
| Lancaster .....                       | L., N. S. & N. A. R. R. .... | 997          |
| Lawton's Bluff .....                  | Paducah & E. R. R. ....      | 506          |
| Lebanon .....                         | L., N. S. & N. A. R. R. .... | 752          |
| Lebanon Junction .....                | L., N. S. & N. A. R. R. .... | 426          |
| Leon .....                            | C. & O. R. R. ....           | 598          |
| Lewis Crossing, tunnel, surface ..... | Paducah & E. R. R. ....      | 611          |
| Lexington .....                       | C. S. R. R. ....             | 975          |
| Do .....                              | C. & O. R. R. ....           | 946          |
| Do .....                              | L., C. & L. R. R. ....       | 867          |
| Liberty .....                         | L., C. & L. R. R. ....       | 496          |
| Litchfield .....                      | Paducah & E. R. R. ....      | 710          |
| Livingston .....                      | L., N. S. & N. A. R. R. .... | 856          |
| Long Grove .....                      | Paducah & E. R. R. ....      | 656          |
| Loretto .....                         | L., N. S. & N. A. R. R. .... | 709          |
| Louisville .....                      | L., N. S. & N. A. R. R. .... | 438          |
| Do .....                              | L., N. S. & N. A. R. R. .... | 386          |
| Do .....                              | U. S. Signal Office .....    | 530          |
| Lowell .....                          | L., N. S. & N. A. R. R. .... | 797          |
| Ludlow .....                          | C. S. R. R. ....             | 550          |
| Lulbeind .....                        | E., L. & B. S. R. R. ....    | 1,052        |
| McHenry .....                         | Paducah & E. R. R. ....      | 485          |
| McKinney .....                        | C. S. R. R. ....             | 1,023        |
| MacLeod .....                         | L., N. S. & N. A. R. R. .... | 608          |
| McNary .....                          | Paducah & E. R. R. ....      | 478          |
| Madisonville .....                    | E., H. & N. R. R. ....       | 436          |
| Mason .....                           | C. S. R. R. ....             | 939          |
| Maurice .....                         | L., C. & L. R. R. ....       | 506          |
| Meadow Lawn .....                     | L., N. S. & N. A. R. R. .... | 420          |
| Memphis Junction .....                | L., N. S. & N. A. R. R. .... | 531          |
| Mercers .....                         | Paducah & E. R. R. ....      | 522          |
| Mewe .....                            | E., L. & B. S. R. R. ....    | 843          |
| Millwood .....                        | Paducah & E. R. R. ....      | 654          |
| Mitchellsburgh .....                  | L., N. S. & N. A. R. R. .... | 967          |
| Moran's Summit .....                  | L., N. S. & N. A. R. R. .... | 962          |
| Morehead .....                        | C. & O. R. R. ....           | 712          |
| Moreland .....                        | C. S. R. R. ....             | 1,101        |
| Moscow .....                          | M. & O. R. R. ....           | 313          |
| Mount Guthrie .....                   | L., N. S. & N. A. R. R. .... | 1,119        |
| Mount Savage .....                    | C. & O. R. R. ....           | 601          |
| Mount Sterling .....                  | C. & O. R. R. ....           | 934          |
| Mount Vernon .....                    | L., N. S. & N. A. R. R. .... | 1,111        |
| Muhlenburgh .....                     | Paducah & E. R. R. ....      | 570          |
| Muldraugh .....                       | L., N. S. & N. A. R. R. .... | 738          |
| Munfordville .....                    | L., N. S. & N. A. R. R. .... | 568          |
| Nazareth .....                        | L., N. S. & N. A. R. R. .... | 691          |
| Nelson Furnace .....                  | L., N. S. & N. A. R. R. .... | 432          |
| New Haven .....                       | L., N. S. & N. A. R. R. .... | 442          |
| New Hope .....                        | L., N. S. & N. A. R. R. .... | 486          |
| Newport .....                         | L., C. & L. R. R. ....       | 523          |
| Nicholasville .....                   | C. S. R. R. ....             | 960          |
| Nolin .....                           | L., N. S. & N. A. R. R. .... | 658          |
| Normal .....                          | C. & O. R. R. ....           | 539          |
| North Fork .....                      | L., N. S. & N. A. R. R. .... | 932          |
| Nortonville .....                     | Paducah & E. R. R. ....      | 492          |
| Do .....                              | E., H. & N. R. R. ....       | 410          |
| Do .....                              | C. S. R. R. ....             | 1,137        |
| Norwood .....                         | L., N. S. & N. A. R. R. .... | 529          |
| Oakland .....                         | L., N. S. & N. A. R. R. .... | 451          |
| Old Deposit .....                     | L., N. S. & N. A. R. R. .... | 451          |
| Olive Hill .....                      | C. & O. R. R. ....           | 752          |
| Olmstead .....                        | L., N. S. & N. A. R. R. .... | 561          |

| Station.                    | Authority.                   | Elevation.   |
|-----------------------------|------------------------------|--------------|
|                             |                              | <i>Feet.</i> |
| Olympia .....               | C. & O. R. R. ....           | 751          |
| Orel .....                  | L., N. S. & N. A. R. R. .... | 410          |
| Otisville .....             | Paducah & E. R. R. ....      | 528          |
| Otter Creek .....           | L., N. S. & N. A. R. R. .... | 662          |
| Owensborough Junction ..... | Paducah & E. R. R. ....      | 495          |
| Paducah .....               | Paducah & E. R. R. ....      | 484          |
| Paint Lick .....            | L., N. S. & N. A. R. R. .... | 792          |
| Parksville .....            | L., N. S. & N. A. R. R. .... | 1,050        |
| Patton's Water Tank .....   | C. S. R. R. ....             | 1,143        |
| Pendleton .....             | L., C. & L. R. R. ....       | 838          |
| Penick .....                | L., N. S. & N. A. R. R. .... | 928          |
| Pine Grove .....            | C. & O. R. R. ....           | 960          |
| Pine Hill .....             | L., N. S. & N. A. R. R. .... | 964          |
| Pine Knot .....             | C. S. R. R. ....             | 1,428        |
| Pleasant Valley .....       | L., N. S. & N. A. R. R. .... | 1,108        |
| Pleasure Ridge Park .....   | L., N. S. & N. A. R. R. .... | 445          |
| Point Burnside .....        | C. S. R. R. ....             | 782          |
| Preston .....               | C. & O. R. R. ....           | 741          |
| Prewitt .....               | C. & O. R. R. ....           | 1,054        |
| Princeton .....             | Paducah & E. R. R. ....      | 624          |
| Pulaaki .....               | C. S. R. R. ....             | 1,135        |
| Quarry Switch .....         | L., N. S. & N. A. R. R. .... | 461          |
| Randolph .....              | L., N. S. & N. A. R. R. .... | 435          |
| Red Hill .....              | L., N. S. & N. A. R. R. .... | 749          |
| Richmond .....              | L., N. S. & N. A. R. R. .... | 924          |
| Do .....                    | L., N. S. & N. A. R. R. .... | 842          |
| Richwood .....              | C. S. R. R. ....             | 939          |
| Riley's .....               | L., N. S. & N. A. R. R. .... | 912          |
| Rineyville .....            | L., N. S. & N. A. R. R. .... | 806          |
| Robard's Station .....      | E., H. & N. R. R. ....       | 390          |
| Rockfield .....             | L., N. S. & N. A. R. R. .... | 566          |
| Rockport, Green River ..... | Paducah & E. R. R. ....      | 485          |
| Rocky Hill .....            | L., N. S. & N. A. R. R. .... | 594          |
| Roger's Gap .....           | C. S. R. R. ....             | 928          |
| Rosine .....                | Paducah & E. R. R. ....      | 597          |
| Rowlett's .....             | L., N. S. & N. A. R. R. .... | 608          |
| Russellville .....          | L., N. S. & N. A. R. R. .... | 532          |
| Sadieville .....            | C. S. R. R. ....             | 872          |
| Saint Barnard .....         | Paducah & E. R. R. ....      | 488          |
| Saint Charles .....         | Paducah & E. R. R. ....      | 509          |
| Saint Mary's .....          | L., N. S. & N. A. R. R. .... | 731          |
| Salt Lick .....             | C. & O. R. R. ....           | 656          |
| Samuel's .....              | L., N. S. & N. A. R. R. .... | 650          |
| Sandersville .....          | C. S. R. R. ....             | 961          |
| Sayer's .....               | L., N. S. & N. A. R. R. .... | 672          |
| Science Hill .....          | C. S. R. R. ....             | 1,130        |
| Scottsburgh .....           | Paducah & E. R. R. ....      | 667          |
| Shepherdsville .....        | L., N. S. & N. A. R. R. .... | 424          |
| Sherman .....               | C. S. R. R. ....             | 939          |
| Silver Creek .....          | L., N. S. & N. A. R. R. .... | 802          |
| Sloan's Valley .....        | C. S. R. R. ....             | 926          |
| Smith's Grove .....         | L., N. S. & N. A. R. R. .... | 605          |
| Somerset .....              | C. S. R. R. ....             | 882          |
| Sonora .....                | L., N. S. & N. R. R. ....    | 697          |
| South Covington .....       | L., C. & L. R. R. ....       | 537          |
| South Danville .....        | L., N. S. & N. A. R. R. .... | 967          |
| South Fork .....            | C. S. R. R. ....             | 991          |
| South Union .....           | L., N. S. & N. A. R. R. .... | 517          |
| Sparta .....                | L., C. & L. R. R. ....       | 505          |
| Spring Lick .....           | Paducah & E. R. R. ....      | 438          |
| Stanford .....              | L., N. S. & N. A. R. R. .... | 919          |
| Stepstone .....             | C. & O. R. R. ....           | 777          |
| Stevensburg .....           | Paducah & E. R. R. ....      | 662          |
| Stithon .....               | L., N. S. & N. A. R. R. .... | 653          |

| Station.                      | Authority.                   | Elevation.   |
|-------------------------------|------------------------------|--------------|
|                               |                              | <i>Feet.</i> |
| Strawberry .....              | L., N. S. & N. A. R. R. .... | 430          |
| Sulphur .....                 | L., C. & L. R. R. ....       | 691          |
| Tateville .....               | C. S. R. R. ....             | 887          |
| Thompson's .....              | C. & O. R. R. ....           | 1,037        |
| Tibbs .....                   | E., L. & B. S. R. R. ....    | 967          |
| Tip Top .....                 | L., N. S. & N. A. R. R. .... | 758          |
| Tradewater .....              | Paducah & E. R. R. ....      | 507          |
| Triplett .....                | C. & O. R. R. ....           | 950          |
| Turner's .....                | L., C. & L. R. R. ....       | 748          |
| Tygart .....                  | C. & O. R. R. ....           | 777          |
| Upton .....                   | L., N. S. & N. A. R. R. .... | 722          |
| Valley .....                  | L., N. S. & N. A. R. R. .... | 410          |
| Verona .....                  | L., C. & L. R. R. ....       | 870          |
| Vine Grove .....              | L., N. S. & N. A. R. R. .... | 719          |
| Walton .....                  | C. S. R. R. ....             | 927          |
| Waynesburgh .....             | C. S. R. R. ....             | 1,230        |
| West Chatteroi Junction ..... | C. & O. R. R. ....           | 533          |
| West Point .....              | L., N. S. & N. A. R. R. .... | 410          |
| Whippoorwill .....            | L., N. S. & N. A. R. R. .... | 537          |
| White Oak .....               | C. S. R. R. ....             | 971          |
| White Plains .....            | Paducah & E. R. R. ....      | 477          |
| Whitley .....                 | C. S. R. R. ....             | 1,336        |
| Whitney .....                 | C. S. R. R. ....             | 872          |
| Williamstown .....            | C. S. R. R. ....             | 958          |
| Wilmore .....                 | C. S. R. R. ....             | 887          |
| Winchester .....              | C. & O. R. R. ....           | 964          |
| Windom .....                  | C. S. R. R. ....             | 1,034        |
| Woodburn .....                | L., N. S. & N. A. R. R. .... | 608          |
| Woodland .....                | L., N. S. & N. A. R. R. .... | 621          |
| Worthville .....              | L., C. & L. R. R. ....       | 486          |
| Zim .....                     | L., C. & L. R. R. ....       | 678          |

# LOUISIANA.

| Station.                                    | Authority.                  | Elevation.   |
|---------------------------------------------|-----------------------------|--------------|
|                                             |                             | <i>Fest.</i> |
| Algiers .....                               | Morgan's L. & T. R. R. .... | 11           |
| Baldwin .....                               | Morgan's L. & T. R. R. .... | 16           |
| Bayou Salé .....                            | Morgan's L. & T. R. R. .... | 10           |
| Berwick .....                               | Morgan's L. & T. R. R. .... | 6            |
| Boeuf .....                                 | Morgan's L. & T. R. R. .... | 2            |
| Boutte .....                                | Morgan's L. & T. R. R. .... | 6            |
| Broussardville .....                        | Morgan's L. & T. R. R. .... | 40           |
| Carencro .....                              | Morgan's L. & T. R. R. .... | 45           |
| Chatahoula .....                            | Morgan's L. & T. R. R. .... | 6            |
| Chef Menteur .....                          | N. O., M. & T. R. R. ....   | 9            |
| Des Allemands .....                         | Morgan's L. & T. R. R. .... | 4            |
| Franklin .....                              | Morgan's L. & T. R. R. .... | 13           |
| Grand Coteau .....                          | Morgan's L. & T. R. R. .... | 51           |
| Jeannerette .....                           | Morgan's L. & T. R. R. .... | 22           |
| Lake Charles .....                          | Toner .....                 | 22           |
| Morgan City .....                           | Morgan's L. & T. R. R. .... | 6            |
| New Iberia .....                            | Morgan's L. & T. R. R. .... | 22           |
| New Orleans .....                           | Jackson & Gt. N. R. R. .... | 4            |
| Do .....                                    | Pontchartrain R. R. ....    | 15           |
| Do .....                                    | N. O., M. & T. R. R. ....   | 16           |
| Do .....                                    | Signal Station .....        | 52           |
| Opelousas .....                             | U. S. Signal Office .....   | 59           |
| Pattersonville .....                        | Morgan's L. & T. R. R. .... | 9            |
| Port Eads, South Pass, Signal Station ..... | Morgan's L. & T. R. R. .... | 7            |
| Raceland .....                              | U. S. Signal Office .....   | 6            |
| Rigolets .....                              | Morgan's L. & T. R. R. .... | 9            |
| Shreveport .....                            | N. O., M. & T. R. R. ....   | 198          |
| Do .....                                    | T. & P. R. R. ....          | 227          |
| Do .....                                    | Signal Station .....        | 8            |
| Slidell .....                               | U. S. Signal Office .....   | 20           |
| Sorrell .....                               | N. O. & N. E. R. R. ....    | 20           |
| Surel .....                                 | Morgan's L. & T. R. R. .... | 16           |
| Terre Bonne .....                           | Morgan's L. & T. R. R. .... | 4            |
| Tigerville .....                            | Morgan's L. & T. R. R. .... | 42           |
| Vermillionville .....                       | Morgan's L. & T. R. R. .... | 42           |
| Washington .....                            | Morgan's L. & T. R. R. .... | 30           |
| West Pearl River .....                      | N. O. & N. E. R. R. ....    |              |

# MAINE.

| Station.                         | Authority.                     | Elevation.   |
|----------------------------------|--------------------------------|--------------|
|                                  |                                | <i>Feet.</i> |
| Abraham, Mount.....              | Geol. Survey of Maine.....     | 3,388        |
| Agamenticus, Mount.....          | Toner.....                     | 673          |
| Allegnash, Lake.....             | Water-power of Maine.....      | 950          |
| Atteau, Lake.....                | Water-power of Maine.....      | 1,094        |
| Auburn.....                      | Me. Cent. R. R.....            | 184          |
| Augusta.....                     | Me. Cent. R. R.....            | 48           |
| Bancroft.....                    | European & N. A. R. R.....     | 333          |
| Bangor.....                      | Me. Cent. R. R.....            | 13           |
| Do.. Thomas Hill.....            | U. S. C. & G. S.....           | 242          |
| Do.. Exchange street.....        | European & N. A. R. R.....     | 11           |
| Do.. Signal Station.....         | U. S. Signal Office.....       | 20           |
| Barker's Mountain.....           | Toner.....                     | 2,551        |
| Basin Mills.....                 | European & N. A. R. R.....     | 56           |
| Baskahegan, Lake.....            | Water-power of Maine.....      | 400          |
| Belfast, City Point.....         | Me. Cent. R. R.....            | 29           |
| Bethel.....                      | Grand Trunk R. R.....          | 646          |
| Bowdoinham.....                  | Me. Cent. R. R.....            | 10           |
| Brewer.....                      | Bucksport & Bangor R. R.....   | 34           |
| Brewer Village.....              | Bucksport & Bangor R. R.....   | 24           |
| Brooks.....                      | Me. Cent. R. R.....            | 376          |
| Brownfield.....                  | Port. & Ogden. R. R.....       | 396          |
| Brunswick.....                   | Me. Cent. R. R.....            | 64           |
| Bryant's Pond.....               | Grand Trunk R. R.....          | 706          |
| Bucksport.....                   | Bucksport and Bangor R. R..... | 5            |
| Bucksport Center.....            | Bucksport and Bangor R. R..... | 99           |
| Burnham.....                     | Me. Cent. R. R.....            | 157          |
| Conquogomoc Lake.....            | Water-power of Maine.....      | 930          |
| Chamberlain Lake.....            | Water-power of Maine.....      | 926          |
| Chesuncook, Lake.....            | Water-power of Maine.....      | 900          |
| Chiputneticook, Lake.....        | Water power of Maine.....      | 382          |
| Chiputneticook, Lake, Grand..... | Water-power of Maine.....      | 449          |
| Churchill Lake.....              | Water-power of Maine.....      | 914          |
| Clinton.....                     | Me. Cent. R. R.....            | 133          |
| Costigan.....                    | European & N. A. R. R.....     | 111          |
| Cumberland Junction.....         | Me. Cent. R. R.....            | 59           |
| Cumberland.....                  | Me. Cent. R. R.....            | 56           |
| Do.....                          | Grand Trunk R. R.....          | 88           |
| Curtis Corner.....               | Me. Cent. R. R.....            | 331          |
| Danforth.....                    | European & N. A. R. R.....     | 379          |
| Danville June.....               | Grand Trunk R. R.....          | 200          |
| Denning's Lake.....              | Toner.....                     | 88           |
| East Baldwin Station.....        | Port. & Ogden. R. R.....       | 312          |
| East Concord.....                | Port. & Ogden. R. R.....       | 881          |
| East Livermore.....              | Me. Cent. R. R.....            | 327          |
| Eastport, Signal Station.....    | U. S. Signal Office.....       | 61           |
| Eaton.....                       | European & N. A. R. R.....     | 400          |
| Empire Road.....                 | Grand Trunk R. R.....          | 278          |
| Enfield.....                     | European & N. A. R. R.....     | 190          |
| Falmouth.....                    | Grand Trunk R. R.....          | 49           |
| Fish River Lake.....             | Water-power of Maine.....      | 660          |
| Forest.....                      | European & N. A. R. R.....     | 435          |
| Freeport.....                    | Me. Cent. R. R.....            | 127          |
| Fryeburgh Station.....           | Port. & Ogden. R. R.....       | 420          |
| Gardiner.....                    | Me. Cent. R. R.....            | 23           |
| Gilead.....                      | Grand Trunk R. R.....          | 711          |
| Gray.....                        | Me. Cent. R. R.....            | 106          |
| Great Works.....                 | European & N. A. R. R.....     | 85           |
| Green.....                       | Me. Cent. R. R.....            | 297          |
| Greenbush.....                   | European & N. A. R. R.....     | 124          |

| Station.                                              | Authority.                    | Elevation.   |
|-------------------------------------------------------|-------------------------------|--------------|
|                                                       |                               | <i>Feet.</i> |
| Hallowell .....                                       | Me. Cent. R. R. ....          | 54           |
| Harwood's Road .....                                  | Me. Cent. R. R. ....          | 17           |
| Howard .....                                          | U. S. C. & G. S. ....         | 269          |
| Katahdin, Mount .....                                 | Eastman .....                 | 5,200        |
| Kendall's Mills .....                                 | Me. Cent. R. R. ....          | 122          |
| Kingman .....                                         | European & N. A. R. R. ....   | 325          |
| Lambert Lake .....                                    | European & N. A. R. R. ....   | 417          |
| Leeds Centre .....                                    | Me. Cent. R. R. ....          | 285          |
| Leeds Crossing .....                                  | Me. Cent. R. R. ....          | 271          |
| Leeds Depot .....                                     | Me. Cent. R. R. ....          | 266          |
| Lewiston .....                                        | Me. Cent. R. R. ....          | 200          |
| Lincoln .....                                         | European & N. A. R. R. ....   | 205          |
| Lincoln Centre .....                                  | European & N. A. R. R. ....   | 167          |
| Locke's Mills .....                                   | Grand Trunk R. R. ....        | 718          |
| Long Lake .....                                       | Water-power of Maine .....    | 603          |
| Long Pond .....                                       | Water-power of Maine .....    | 1,094        |
| Lunenburg .....                                       | Port. & Ogden. R. R. ....     | 850          |
| Mattagamon .....                                      | Water-power of Maine .....    | 850          |
| Mattawamkeag .....                                    | European & N. A. R. R. ....   | 205          |
| Mattinicus West Light .....                           | U. S. C. & G. S. ....         | 37           |
| Mechanic Falls .....                                  | Grand Trunk R. R. ....        | 298          |
| Miles' Pond .....                                     | Port. & Ogden. R. R. ....     | 1,026        |
| Milford .....                                         | European & N. A. R. R. ....   | 114          |
| Milinoquet, Lake .....                                | Water-power of Maine .....    | 500          |
| Monmouth .....                                        | Me. Cent. R. R. ....          | 266          |
| Moosehead Lake .....                                  | Water-power of Maine .....    | 1,023        |
| Mooseheadmaguntio Lake .....                          | Water-power of Maine .....    | 1,486        |
| Mount Desert .....                                    | U. S. C. & G. S. ....         | 1,527        |
| New Gloucester .....                                  | Me. Cent. R. R. ....          | 113          |
| Newport .....                                         | Me. Cent. R. R. ....          | 200          |
| North Leeds .....                                     | Me. Cent. R. R. ....          | 280          |
| North Yarmouth .....                                  | Grand Trunk R. R. ....        | 100          |
| Oak Hill .....                                        | Me. Cent. R. R. ....          | 125          |
| Olamon .....                                          | European & N. A. R. R. ....   | 121          |
| Oldtown .....                                         | European & N. A. R. R. ....   | 88           |
| Orono .....                                           | European & N. A. R. R. ....   | 71           |
| Orrington .....                                       | Bucksport & Bangor R. R. .... | 146          |
| Owl's Head Light .....                                | U. S. C. & G. S. ....         | 85           |
| Oxford .....                                          | Grand Trunk R. R. ....        | 331          |
| Pamedumcook Lake .....                                | Water-power of Maine .....    | 500          |
| Paris .....                                           | Grand Trunk R. R. ....        | 483          |
| Passadumkeag .....                                    | European & N. A. R. R. ....   | 131          |
| Pawnal .....                                          | Grand Trunk R. R. ....        | 143          |
| Pigeon Hill .....                                     | U. S. C. & G. S. ....         | 315          |
| Pittsfield .....                                      | Me. Cent. R. R. ....          | 210          |
| Pleasant, Mount .....                                 | Guyot .....                   | 2,021        |
| Pomgocwahem Lake .....                                | Water-power of Maine .....    | 914          |
| Portage Lake .....                                    | Water-power of Maine .....    | 625          |
| Portland .....                                        | Me. Cent. R. R. ....          | 13           |
| Do .....                                              | Grand Trunk R. R. ....        | 15           |
| Do .....                                              | Portland & Roch. R. R. ....   | 10           |
| Do..copper bolt at G. T. R. R. freight<br>house ..... | Port. & Ogden. R. R. ....     | 16           |
| Do..Brownhall Hill .....                              | U. S. C. & G. S. ....         | 176          |
| Do..R. R. wharf .....                                 | U. S. C. & G. S. ....         | 4            |
| Do..Signal Station .....                              | U. S. Signal Office .....     | 45           |
| Pownal .....                                          | Grand Trunk R. R. ....        | 143          |
| Prince Regent's Redoubt .....                         | U. S. C. & G. S. ....         | 197          |
| Ragged Mountain .....                                 | U. S. C. & G. S. ....         | 1,301        |
| Rangleley Lake .....                                  | Water-power of Maine .....    | 1,511        |
| Richardson, Lake .....                                | Water-power of Maine .....    | 1,456        |
| Richmond .....                                        | Me. Cent. R. R. ....          | 77           |
| Richville Station (Standish) .....                    | Port. & Ogden, R. R. ....     | 315          |

| Station.                               | Authority.                    | Elevation.  |
|----------------------------------------|-------------------------------|-------------|
|                                        |                               | <i>Fet.</i> |
| Ripogenus, Lake .....                  | Water-power of Maine .....    | 878         |
| Schoodic Lake .....                    | Water-power of Maine .....    | 300         |
| Sebago, Lake .....                     | Water-power of Maine .....    | 247         |
| Do..... Station (Standish).....        | Port. & Ogden. R. R. ....     | 274         |
| Do..... (water surface).....           | Port. & Ogden. R. R. ....     | 263         |
| Sebattis Mountain .....                | U. S. C. & G. S. ....         | 801         |
| Sebec Lake .....                       | Water-power of Maine .....    | 375         |
| South Gardiner .....                   | Me. Cent. R. R. ....          | 25          |
| South Orrington .....                  | Bucksport & Bangor R. R. .... | 34          |
| South Paris .....                      | Grand Trunk R. R. ....        | 389         |
| South Winn .....                       | European & N. A. R. R. ....   | 194         |
| Square-and-Cross Lake.....             | Water-power of Maine.....     | 587         |
| Squawpan Lake .....                    | Water-power of Maine.....     | 580         |
| Standish Plains (natural surface)..... | Port. & Ogden. R. R. ....     | 299         |
| Steep Falls Station (Standish).....    | Port. & Ogden. R. R. ....     | 305         |
| Strickland's Ferry.....                | Me. Cent. R. R. ....          | 305         |
| Tenant's Harbor Light .....            | U. S. C. & G. S. ....         | 44          |
| Thorndyke.....                         | Me. Cent. R. R. ....          | 267         |
| Tomat .....                            | European & N. A. R. R. ....   | 375         |
| Topsham.....                           | Me. Cent. R. R. ....          | 43          |
| Umbagog Lake.....                      | Water-power of Maine.....     | 1,256       |
| Unity.....                             | Me. Cent. R. R. ....          | 223         |
| Vanceborough .....                     | European & N. A. R. R. ....   | 394         |
| Veazie .....                           | European & N. A. R. R. ....   | 110         |
| Walnut Hill.....                       | Me. Cent. R. R. ....          | 180         |
| Waterville .....                       | Me. Cent. R. R. ....          | 117         |
| Webster .....                          | European & N. A. R. R. ....   | 68          |
| West Baldwin Station.....              | Port. & Ogden. R. R. ....     | 364         |
| West Bethel .....                      | Grand Trunk R. R. ....        | 675         |
| Westbrook .....                        | Me. Cent. R. R. ....          | 101         |
| Do.... Station, crossing Port. & Roch. |                               |             |
| R. R. ....                             | Port. & Ogden. R. R. ....     | 19          |
| West Falmouth .....                    | Me. Cent. R. R. ....          | 43          |
| West Paris.....                        | Grand Trunk R. R. ....        | 483         |
| White Head Light .....                 | U. S. C. & G. S. ....         | 44          |
| White Rock Station (Gorham).....       | Port. & Ogden. R. R. ....     | 213         |
| Wilderness .....                       | European & N. A. R. R. ....   | 467         |
| Windham Station (south) .....          | Port. & Ogden. R. R. ....     | 131         |
| Winn .....                             | European & N. A. R. R. ....   | 201         |
| Winthrop .....                         | Me. Cent. R. R. ....          | 220         |
| Woodford's .....                       | Me. Cent. R. R. ....          | 61          |
| Wood Lake .....                        | Water-power of Maine.....     | 1,094       |
| Wytotitlock .....                      | European & N. A. R. R. ....   | 343         |
| Yarmouth .....                         | Me. Cent. R. R. ....          | 88          |
| Do.....                                | Grand Trunk R. R. ....        | 94          |
| Do.... Junction .....                  | Grand Trunk R. R. ....        | 88          |

# MARYLAND.

| Station.                                                                                        | Authority.                           | Elevation.   |
|-------------------------------------------------------------------------------------------------|--------------------------------------|--------------|
|                                                                                                 |                                      | <i>Feet.</i> |
| Aberdeen .....                                                                                  | P. W. & B. R. R .....                | 758          |
| Airey's .....                                                                                   | D. & D. R. R .....                   | 74           |
| Agricultural College .....                                                                      | U. S. C. & G. S. ....                | 258          |
| Alesia .....                                                                                    | B. & H. R. R .....                   | 702          |
| Altamont .....                                                                                  | B. & O. R. R .....                   | 2,620        |
| Annapolis, B. M. (a) .....                                                                      | U. S. C. & G. S .....                | 4            |
| Do.... B. M. (b) .....                                                                          | U. S. C. & G. S .....                | 4            |
| Do.... B. M., church on West street .....                                                       | U. S. C. & G. S .....                | 43           |
| Antietam Creek .....                                                                            | W. Md. R. R .....                    | 460          |
| Ark Haven .....                                                                                 | C. & P. D. R. R .....                | 80           |
| Arlington .....                                                                                 | W. Md. R. R .....                    | 420          |
| Avondale .....                                                                                  | W. Md. R. R .....                    | 540          |
| Bachman Val. Grove .....                                                                        | B. & H. R. R .....                   | 741          |
| Bald Friar .....                                                                                | C. & P. D. R. R .....                | 78           |
| Baltimore .....                                                                                 | B. & O. R. R .....                   | 24           |
| Do.... Canton wharf .....                                                                       | W. Md. R. R .....                    | 20           |
| Do.... east facade of tunnel .....                                                              | B. & P. R. R .....                   | 67           |
| Do.... Pennsylvania avenue .....                                                                | B. & P. R. R .....                   | 131          |
| Do.... LaFayette avenue .....                                                                   | B. & P. R. R .....                   | 164          |
| Do.... Calverton road .....                                                                     | B. & P. R. R .....                   | 133          |
| Do.... Frederick road .....                                                                     | B. & P. R. R .....                   | 154          |
| Do.... Mount Clare Station .....                                                                | B. & P. R. R .....                   | 68           |
| Do.... President street depot .....                                                             | P. W. & B. R. R .....                | 9            |
| Do.... Signal Station .....                                                                     | U. S. Signal Office .....            | 45           |
| Barnesville .....                                                                               | B. & O. R. R .....                   | 500          |
| Bartholows .....                                                                                | B. & O. R. R .....                   | 463          |
| Bayview Junction, Union Railroad .....                                                          | P. W. & B. R. R .....                | 36           |
| Beelers Summit .....                                                                            | B. & O. R. R .....                   | 678          |
| Benning's .....                                                                                 | B. & P. R. R .....                   | 35           |
| Bladensburg, meeting house .....                                                                | U. S. C. & G. S .....                | 51           |
| Bloomington—B. M. on top step northwest corner B. & O. Railroad bridge over Potomac River ..... | U. S. C. & G. S .....                | 1,008        |
| Blue Ridge Summit .....                                                                         | W. Md. R. R .....                    | 1,373        |
| Bowie .....                                                                                     | B. & P. R. R .....                   | 149          |
| Boys .....                                                                                      | B. & O. R. R .....                   | 418          |
| Breathedsville .....                                                                            | B. & O. R. R .....                   | 472          |
| Brownsville .....                                                                               | B. & O. R. R .....                   | 535          |
| Cambridge, high water at .....                                                                  | D. & D. R. R .....                   | 57           |
| Do.... railroad grade .....                                                                     | D. & D. R. R .....                   | 62           |
| Carrollton .....                                                                                | W. Md. R. R .....                    | 550          |
| Charlestown .....                                                                               | P. W. & B. R. R .....                | 39           |
| Chase's .....                                                                                   | P. W. & B. R. R .....                | 20           |
| Chewsville .....                                                                                | W. Md. R. R .....                    | 575          |
| Claggetts .....                                                                                 | B. & O. R. R .....                   | 619          |
| Crisfield .....                                                                                 | E. S. R. R .....                     | 3            |
| Cumberland .....                                                                                | Cumberland & Pennsylvania R. R. .... | 639          |
| Do.... .....                                                                                    | Cumberland Turnpike .....            | 635          |
| Do.... .....                                                                                    | Penna. R. R .....                    | 642          |
| Do.... .....                                                                                    | B. & O. R. R .....                   | 639          |
| Do.... B. M. on coping stone of feed-lock west terminus of Chesapeake and Ohio Canal .....      | U. S. C. & G. S .....                | 624          |
| Do.... Basin Chesapeake and Ohio Canal .....                                                    | C. & O. Canal .....                  | 609          |
| Dickerson's .....                                                                               | C. & O. Canal .....                  | 357          |
| Double Pike Creek .....                                                                         | W. Md. R. R .....                    | 300          |
| Eakil's Mill .....                                                                              | B. & O. R. R .....                   | 412          |



| Station.                                                                             | Authority.                           | Elevation.   |
|--------------------------------------------------------------------------------------|--------------------------------------|--------------|
|                                                                                      |                                      | <i>Feet.</i> |
| East Federalsburgh .....                                                             | D. & D. R. R. ....                   | 71           |
| East New Market .....                                                                | D. & D. R. R. ....                   | 99           |
| Edgewood .....                                                                       | P. W. & B. R. R. ....                | 30           |
| Elkton .....                                                                         | P. W. & B. R. R. ....                | 28           |
| Ellerslie .....                                                                      | B. & O. R. R. ....                   | 729          |
| Emory Grove Station, junction Western Maryland Railroad .....                        | B. & H. R. R. ....                   | 652          |
| Fairview .....                                                                       | B. & H. R. R. ....                   | 676          |
| Frederick .....                                                                      | Pa. R. R. ....                       | 220          |
| Do. ....                                                                             | W. Md. R. R. ....                    | 415          |
| Do. Junction .....                                                                   | B. & O. R. R. ....                   | 264          |
| Freelands .....                                                                      | N. C. R. R. ....                     | 596          |
| Frostburgh .....                                                                     | Cumberland Turnpike .....            | 1, 890       |
| Do. ....                                                                             | Cumberland & Pennsylvania R. R. .... | 1, 920       |
| Gaithersburgh .....                                                                  | B. & O. R. R. ....                   | 516          |
| Galt's .....                                                                         | Pa. R. R. ....                       | 486          |
| Georgetown .....                                                                     | Pa. R. R. ....                       | 290          |
| Germantown .....                                                                     | B. & O. R. R. ....                   | 422          |
| Glendale .....                                                                       | B. & P. R. R. ....                   | 150          |
| Glen Falls .....                                                                     | W. Md. R. R. ....                    | 375          |
| Glen Morris .....                                                                    | W. Md. R. R. ....                    | 580          |
| Glyndon .....                                                                        | W. Md. R. R. ....                    | 600          |
| Graceham .....                                                                       | W. Md. R. R. ....                    | 400          |
| Green Mount .....                                                                    | B. & H. R. R. ....                   | 820          |
| Greenwood .....                                                                      | W. Md. R. R. ....                    | 425          |
| Grimes .....                                                                         | Shenandoah Valley R. R. ....         | 352          |
| Gunpowder Bridge .....                                                               | P. W. & B. R. R. ....                | 978          |
| Hagerstown .....                                                                     | Shenandoah Valley R. R. ....         | 566          |
| Do. ....                                                                             | W. Md. R. R. ....                    | 520          |
| Do. ....                                                                             | Cumberland Valley R. R. ....         | 572          |
| Do. ....                                                                             | B. & O. R. R. ....                   | 527          |
| Do. Junction .....                                                                   | B. & O. R. R. ....                   | 249          |
| Do. B. M. on water table of C. H. corner Washington and Jonathan streets. ....       | U. S. C. & G. S. ....                | 552          |
| Hampstead .....                                                                      | B. & H. R. R. ....                   | 830          |
| Hancock, B. M. on coping stone of lock 53, Chesapeake and Ohio Canal aqueduct .....  | U. S. C. & G. S. ....                | 474          |
| Do. B. M. on coping stone middle north side Chesapeake and Ohio Canal aqueduct ..... | U. S. C. & G. S. ....                | 421          |
| Harmans .....                                                                        | B. & P. R. R. ....                   | 126          |
| Harmony Grove .....                                                                  | Pa. R. R. ....                       | 310          |
| Havre de Grace .....                                                                 | Pa. R. R. ....                       | 16           |
| Howardsville .....                                                                   | W. Md. R. R. ....                    | 455          |
| Hurlock's .....                                                                      | D. & D. R. R. ....                   | 104          |
| Junction .....                                                                       | W. Md. R. R. ....                    | 460          |
| Keedysville .....                                                                    | B. & O. R. R. ....                   | 393          |
| Knowles .....                                                                        | B. & O. R. R. ....                   | 296          |
| Ladiesburgh .....                                                                    | Pa. R. R. ....                       | 464          |
| Lanham's .....                                                                       | B. & P. R. R. ....                   | 143          |
| Linkwood .....                                                                       | D. & D. R. R. ....                   | 78           |
| Linsted .....                                                                        | U. S. C. & G. S. ....                | 158          |
| Linwood .....                                                                        | W. Md. R. R. ....                    | 390          |
| Lonaconing .....                                                                     | Cumberland & Pennsylvania R. R. .... | 1, 560       |
| Loys .....                                                                           | W. Md. R. R. ....                    | 300          |
| Magnolia .....                                                                       | P. W. & B. R. R. ....                | 28           |
| Marriott .....                                                                       | U. S. C. & G. S. ....                | 249          |
| Martinsburg, junction with B. & O. R. R. ....                                        | Cumberland Valley R. R. ....         | 634          |
| Maryland Heights .....                                                               | U. S. C. & G. S. ....                | 1, 456       |
| Mechanicstown .....                                                                  | W. Md. R. R. ....                    | 520          |

| Station.                                                     | Authority.                             | Elevation.   |
|--------------------------------------------------------------|----------------------------------------|--------------|
|                                                              |                                        | <i>Feet.</i> |
| Middleburgh.....                                             | W. Md. R. R.....                       | 415          |
| Monocacy River.....                                          | W. Md. R. R.....                       | 280          |
| Mount Airy.....                                              | B. & O. R. R.....                      | 813          |
| Mount Hope.....                                              | W. Md. R. R.....                       | 440          |
| Mount Savage.....                                            | Cumberland & Pennsylvania<br>R. R..... | 1,206        |
| Do..... Junction.....                                        | B. & O. R. R.....                      | 687          |
| Do..... Station.....                                         | B. & O. R. R.....                      | 703          |
| Mount Vernon.....                                            | N. C. R. R.....                        | 131          |
| New Midway.....                                              | Pa. R. R.....                          | 458          |
| New Windsor.....                                             | W. Md. R. R.....                       | 440          |
| North East.....                                              | P. W. & B. R. R.....                   | 43           |
| Oakland.....                                                 | B. & O. R. R.....                      | 2,371        |
| Oakland.....                                                 | W. Md. R. R.....                       | 380          |
| Odenton.....                                                 | U. S. C. & G. S.....                   | 164          |
| Do.. (A. & E. R. R.).....                                    | B. & P. R. R.....                      | 160          |
| Owing's Mills.....                                           | W. Md. R. R.....                       | 480          |
| Parkton.....                                                 | N. C. R. R.....                        | 420          |
| Patapsco.....                                                | W. Md. R. R.....                       | 360          |
| Patuxent.....                                                | U. S. C. & G. S.....                   | 84           |
| Do.....                                                      | B. & P. R. R.....                      | 85           |
| Pen Mar.....                                                 | W. Md. R. R.....                       | 1,200        |
| Perrymansville.....                                          | P. W. & B. R. R.....                   | 42           |
| Perryville, Port Deposit Br. R. R.....                       | P. W. & B. R. R.....                   | 21           |
| Piedmont.....                                                | Cumberland & Pennsylvania<br>R. R..... | 928          |
| Pikesville.....                                              | W. Md. R. R.....                       | 435          |
| Point of Rocks, junction with main line B.<br>& O. R. R..... | B. & O. R. R.....                      | 229          |
| Port Deposit.....                                            | C. & P. D. R. R.....                   | 9            |
| Potomac Bridge.....                                          | Cumberland Valley R. R.....            | 376          |
| Princess Anne.....                                           | E. S. R. R.....                        | 14           |
| Relay Station.....                                           | B. & O. R. R.....                      | 66           |
| Rohrersville.....                                            | B. & O. R. R.....                      | 591          |
| Ritter's.....                                                | Pa. R. R.....                          | 309          |
| Rockville.....                                               | B. & O. R. R.....                      | 421          |
| Rocky Ridge.....                                             | W. Md. R. R.....                       | 370          |
| Sabillasville.....                                           | W. Md. R. R.....                       | 1,120        |
| Saint James.....                                             | Shenandoah Valley R. R.....            | 467          |
| Salisbury.....                                               | E. S. R. R.....                        | 26           |
| Seabrook.....                                                | B. & P. R. R.....                      | 159          |
| Severn.....                                                  | B. & P. R. R.....                      | 166          |
| Sharpsburgh.....                                             | Shenandoah Valley R. R.....            | 445          |
| Silver Spring.....                                           | B. & O. R. R.....                      | 336          |
| Smithsburgh.....                                             | W. Md. R. R.....                       | 750          |
| Soper.....                                                   | U. S. C. & G. S.....                   | 469          |
| Springfield.....                                             | B. & P. R. R.....                      | 167          |
| Stabler.....                                                 | U. S. C. & G. S.....                   | 571          |
| Stimmer's Run.....                                           | P. W. & B. R. R.....                   | 24.50        |
| Stoney Run.....                                              | B. & P. R. R.....                      | 61           |
| Sugar-Loaf Mountain.....                                     | U. S. C. & G. S.....                   | 1,281        |
| Susquehanna, Susquehanna River.....                          | P. W. & B. R. R.....                   | 16           |
| Sykesville.....                                              | B. & O. R. R.....                      | 410          |
| Taneytown.....                                               | Pa. R. R.....                          | 493          |
| Tannery.....                                                 | W. Md. R. R.....                       | 610          |
| Taylor.....                                                  | U. S. C. & G. S.....                   | 95           |
| Terra Cotta.....                                             | B. & O. R. R.....                      | 168          |
| Timber Grove.....                                            | W. Md. R. R.....                       | 550          |
| Timonium.....                                                | N. C. R. R.....                        | 381          |
| Tuscarawa.....                                               | B. & O. R. R.....                      | 224          |
| Union Bridge.....                                            | W. Md. R. R.....                       | 350          |
| Washington Junction.....                                     | B. & O. R. R.....                      | 229          |
| Webb.....                                                    | U. S. C. & G. S.....                   | 236          |
| Westminster.....                                             | W. Md. R. R.....                       | 700          |

| Station.                                                                 | Authority.           | Elevation.   |
|--------------------------------------------------------------------------|----------------------|--------------|
|                                                                          |                      | <i>Feet.</i> |
| Weverton.....                                                            | B. & O. R. R.....    | 249          |
| Williamsburgh.....                                                       | D. & D. R. R.....    | 95           |
| Williamsport.....                                                        | W. Md. R. R.....     | 305          |
| Do.....B. M. on top of stone of west side<br>aqueduct C. & O. Canal..... | U. S. C. & G. S..... | 358          |
| Wilsons.....                                                             | B. & P. R. R.....    | 60           |
| Winans.....                                                              | B. & P. R. R.....    | 29           |
| Woodensburgh.....                                                        | B. & H. R. R.....    | 703          |
| Woodsborough.....                                                        | Pa. R. R.....        | 400          |

# MASSACHUSETTS.

| Station.                                         | Authority.                      | Elevation.         |
|--------------------------------------------------|---------------------------------|--------------------|
| Acton, junction with Framingham & Lowell R. R.   | N., A. & B. R. R.               | <i>Feet.</i><br>44 |
| Allston                                          | Boston & Albany R. R.           | 24                 |
| Amherst                                          | N. L. N. R. R.                  | 258                |
| Do                                               | Mass. Cent. R. R.               | 235                |
| Ashburnham                                       | Vt. & Mass. R. R.               | 1,106              |
| Do.....Summit                                    | Cheshire R. R.                  | 1,084              |
| Ashland                                          | Boston & Albany R. R.           | 184                |
| Athol, junction with Vt. & Mass. R. R.           | Spring., Athol & Northern R. R. | 546                |
| Attleborough                                     | Bost. & Prov. R. R.             | 129                |
| Auburndale                                       | Boston & Albany R. R.           | 63                 |
| Ayer Junction                                    | Worcester & Nashua R. R.        | 230                |
| Bald Peak                                        | Guyot                           | 2,624              |
| Baldwinsville                                    | Boston & Albany R. R.           | 901                |
| Do                                               | Fitchburg R. R.                 | 891                |
| Bandville                                        | Mass. Cent. R. R.               | 405                |
| Barclwell                                        | N. H. & Northampton R. R.       | 238                |
| Barnstable                                       | Cape Cod R. R.                  | 57                 |
| Barre Plains                                     | Boston & Albany R. R.           | 588                |
| Barrett's Junction, crossing N., L. & N. E. R.   | Spring., Athol & Northern R. R. | 329                |
| Becket                                           | Bost. & Albany R. R.            | 1,207              |
| Belchertown                                      | Mass. Cent. R. R.               | 460                |
| Belmont                                          | Mass. Cent. R. R.               | 73                 |
| Bernardstown                                     | Conn. River R. R.               | 359                |
| Billerica                                        | Boston & Albany R. R.           | 110                |
| Blackstone                                       | Prov. & Worces. R. R.           | 197                |
| Bondville                                        | Spring., Athol & Northern R. R. | 350                |
| Boston, B. & M. R. R. station                    | Boston & Maine R. R.            | 14                 |
| Do..sidewalk in front of B. & M. R. R. station   | City Engineer                   | 8                  |
| Do..Mass. Cent. R. R. station                    | Mass. Cent. R. R.               | 10                 |
| Do..Fitchburg R. R. station                      | Fitchburg R. R.                 | 11                 |
| Do..sidewalk in front of Fitchburg R. R. station | City Engineer                   | 6                  |
| Do..B. & P. R. R. station                        | Bost. & Prov. R. R.             | 6                  |
| Do..sidewalk in front of B. & P. R. R. station   | City Engineer                   | 7                  |
| Do..B. & A. R. R. station                        | Boston & Albany R. R.           | 10                 |
| Do..sidewalk in front of B. & A. R. R. station   | City Engineer                   | 7                  |
| Do..B. & L. R. R. station                        | Boston & Lowell R. R.           | 12                 |
| Do..sidewalk in front of B. & L. R. R. station   | City Engineer                   | 6                  |
| Do..Signal Station                               | U. S. Signal Office             | 142                |
| Boylston                                         | Bost. & Prov. R. R.             | 31                 |
| Braggsville                                      | Boston & Albany R. R.           | 243                |
| Brighton                                         | Boston & Albany R. R.           | 24                 |
| Brookfield                                       | Boston & Albany R. R.           | 606                |
| Brookline                                        | Boston & Albany R. R.           | 15                 |
| Do..Junction                                     | Boston & Albany R. R.           | 9                  |
| Brooks' Farm                                     | Boston & Lowell R. R.           | 30                 |
| Canton Junction                                  | Bost. & Prov. R. R.             | 101                |
| Charlton                                         | Boston & Albany R. R.           | 888                |
| Chester                                          | Boston & Albany R. R.           | 596                |
| Chicopee                                         | Conn. River R. R.               | 79                 |
| Clarendon Hills                                  | Bost. & Prov. R. R.             | 50                 |
| Clinton                                          | Worcester & Nashua R. R.        | 309                |
| Coldbrook                                        | Boston & Albany R. R.           | 672                |
| College Hill                                     | Boston & Lowell R. R.           | 31                 |
| Concord                                          | Fitchburg R. R.                 | 135                |
| Cordaville                                       | Boston & Albany R. R.           | 248                |
| Cottage Farm                                     | Boston & Albany R. R.           | 9                  |
| Dalton                                           | Boston & Albany R. R.           | 1,196              |

| Station.                             | Authority.                          | Elevation.   |
|--------------------------------------|-------------------------------------|--------------|
|                                      |                                     | <i>Feet.</i> |
| Deerfield.....                       | Conn. River R. R.....               | 221          |
| Dennyville.....                      | Mass. Cent. R. R.....               | 625          |
| Dodgeville.....                      | Bost. & Prov. R. R.....             | 114          |
| Dorchester Heights.....              | U. S. C. & G. S.....                | 140          |
| Douglass Summit.....                 | Boston & N. Y. R. R.....            | 630          |
| Dunstable, road to Dunstable Station | N., A. & B. R. R.....               | 51           |
| Do..... Wall Hill                    | N., A. & B. R. R.....               | 88           |
| Dwight's.....                        | Mass. Cent. R. R.....               | 245          |
| Eagle Mills.....                     | Mass. Cent. R. R.....               | 555          |
| East Brookfield.....                 | Boston & Albany R. R.....           | 621          |
| East Douglas.....                    | Boston & N. Y. R. R.....            | 517          |
| East Foxborough.....                 | Bost. & Prov. R. R.....             | 211          |
| Eastham.....                         | Cape Cod R. R.....                  | 18           |
| Easthampton.....                     | N. H. & Northampton R. R.....       | 169          |
| East Holliston.....                  | Boston & Albany R. R.....           | 169          |
| East Junction.....                   | Bost. & Prov. R. R.....             | 108          |
| East Mountain (copper bolt).....     | Appalachian Club.....               | 2,276        |
| Do..... (south peak)                 | Appalachian Club.....               | 1,917        |
| East Woburn.....                     | Boston, Lowell & Nashua R. R.....   | 33           |
| Enfield.....                         | Spring., Athol & Northern R.R.....  | 415          |
| Faneuil.....                         | Boston & Albany R. R.....           | 24           |
| Farnum's.....                        | Prov. & Worces. R. R.....           | 284          |
| Fitchburgh.....                      | Fitchburg R. R.....                 | 430          |
| Florence.....                        | N. H. & Northampton R. R.....       | 273          |
| Forest Hills.....                    | Bost. & Prov. R. R.....             | 36           |
| Foxborough.....                      | Framingham & Mansfield R. R.....    | 284          |
| Framingham Center.....               | Bost., Clinton & Fitchburg R.R..... | 188          |
| Franklin.....                        | Boston & N. Y. R. R.....            | 292          |
| Fremont or N. Wareham.....           | Cape Cod R. R.....                  | 60           |
| Gardner.....                         | Fitchburg R. R.....                 | 1,009        |
| Gilbertville.....                    | Boston & Albany R. R.....           | 546          |
| Grafton.....                         | Boston & Albany R. R.....           | 368          |
| Grantville.....                      | Boston & Albany R. R.....           | 140          |
| Greenfield.....                      | V., M., T. & G. R. R.....           | 181          |
| Green Lodge.....                     | Bost. & Prov. R. R.....             | 54           |
| Greenwich.....                       | Spring., Athol & Northern R.R.....  | 455          |
| Greenwich Village.....               | Spring., Athol & Northern R.R.....  | 484          |
| Greylock.....                        | Appalachian Club.....               | 3,535        |
| Do.....                              |                                     | 3,505        |
| Groton.....                          | Worcester & Nashua R. R.....        | 303          |
| Do..... Cow Pond Brook               | N., A. & B. R. R.....               | 82           |
| Groton Junction.....                 | Worcester & Nashua R. R.....        | 230          |
| Do.....                              | Fitchburg R. R.....                 | 234          |
| Hadley.....                          | Mass. Cent. R. R.....               | 122          |
| Harvard.....                         | Worcester & Nashua R. R.....        | 288          |
| Hatfield.....                        | Conn. River R. R.....               | 148          |
| Haverhill.....                       | Boston & Maine R. R.....            | 33           |
| Haydensville.....                    | N. H. & Northampton R. R.....       | 432          |
| Heath.....                           | Bost. & Prov. R. R.....             | 25           |
| Hinsdale.....                        | Boston & Albany R. R.....           | 1,431        |
| Holden.....                          | Mass. Cent. R. R.....               | 758          |
| Holliston.....                       | Boston & Albany R. R.....           | 191          |
| Holyoke.....                         | Conn. River R. R.....               | 94           |
| Holyoke, Mount.....                  | Toner.....                          | 1,120        |
| Hoosac, Mount.....                   | Toner.....                          | 2,510        |
| Do..... east summit over tunnel      | V., M., T. & G. R. R.....           | 2,269        |
| Hoosac Tunnel, east portal.....      | Troy & Greenfield R. R.....         | 759          |
| Do..... central shaft.....           | Troy & Greenfield R. R.....         | 819          |
| Do..... west portal.....             | Troy & Greenfield R. R.....         | 759          |
| Hudson.....                          | Mass. Cent. R. R.....               | 221          |
| Huntington.....                      | Boston & Albany R. R.....           | 373          |
| Hyannis.....                         | Cape Cod R. R.....                  | 25           |
| Hyde Park.....                       | Bost. & Prov. R. R.....             | 51           |
| Indian Orchard.....                  | Boston & Albany R. R.....           | 241          |

| Station.                                   | Authority.                             | Elevation.   |
|--------------------------------------------|----------------------------------------|--------------|
|                                            |                                        | <i>Feet.</i> |
| Jamaica Plain .....                        | Bost. & Prov. R. R. ....               | 33           |
| Jamesville .....                           | Boston & Albany R. R. ....             | 564          |
| Lake Crossing .....                        | Boston & Albany R. R. ....             | 168          |
| Lancaster .....                            | Worcester & Nashua R. R. ....          | 259          |
| Lawrence .....                             | Manch. & Lawrence R. R. ....           | 65           |
| Leeds .....                                | N. H. & Northampton R. R. ....         | 356          |
| Leominster .....                           | Fitchburg R. R. ....                   | 373          |
| Lincoln .....                              | Fitchburg R. R. ....                   | 205          |
| Littleton .....                            | Fitchburg R. R. ....                   | 228          |
| Lowell .....                               | Bost., Lowell & Nashua R. R. ....      | 99           |
| Do. Middlesex street .....                 | Boston & Lowell R. R. ....             | 92           |
| Lowell Junction .....                      | Lowell & Andover R. R. ....            | 103          |
| Lowell Rock Cut .....                      | Boston & Lowell R. R. ....             | 108          |
| Ludlow .....                               | Spring., Athol & North'n R. R. ....    | 239          |
| Lunenburg .....                            | Fitchburg R. R. ....                   | 375          |
| Maces .....                                | Lowell & Andover R. R. ....            | 151          |
| Mansfield .....                            | Bost. & Prov. R. R. ....               | 169          |
| Do. junction with Bost. & Prov. R. R. .... | Framingham & Mansf'd R. R. ....        | 172          |
| Marlborough .....                          | Bost., Clinton & Fitch. R. R. ....     | 378          |
| Melrose .....                              | Boston & Maine R. R. ....              | 62           |
| Metcalf's .....                            | Boston & Albany R. R. ....             | 242          |
| Middleborough .....                        | Cape Cod R. R. ....                    | 96           |
| Middlefield .....                          | Boston & Albany R. R. ....             | 918          |
| Midfield Centre .....                      | Framingham & Mansf'd R. R. ....        | 171          |
| Midfield Junction .....                    | Framingham & Mansf'd R. R. ....        | 136          |
| Milford .....                              | Boston & Albany R. R. ....             | 244          |
| Millbury .....                             | Boston & Albany R. R. ....             | 393          |
| Miller's Falls .....                       | N. L. N. R. R. ....                    | 292          |
| Millville .....                            | Prov. & Worces. R. R. ....             | 208          |
| Montague Depot .....                       | V., M., T. & G. R. R. ....             | 129          |
| Monument .....                             | Cape Cod R. R. ....                    | 7            |
| Mystic .....                               | Boston & Lowell R. R. ....             | 20           |
| Nantasket .....                            | U. S. C. & G. S. ....                  | 128          |
| Do. Tower's Tavern .....                   | U. S. C. & G. S. ....                  | 11           |
| Nantucket Cliff, Nantucket .....           | U. S. C. & G. S. ....                  | 58           |
| Natick .....                               | Boston & Albany R. R. ....             | 170          |
| Newburyport .....                          | U. S. C. & G. S. ....                  | 124          |
| New Salem .....                            | Spring., Athol & North'n R. R. ....    | 522          |
| Newton .....                               | Boston & Albany R. R. ....             | 46           |
| Newtonville .....                          | Boston & Albany R. R. ....             | 57           |
| North Adams .....                          | Troy & Greenfield R. R. ....           | 686          |
| Northampton .....                          | Conn. River R. R. ....                 | 125          |
| North Ashburnham .....                     | Cheshire R. R. ....                    | 1,066        |
| North Billerica .....                      | B. & L. R. R. ....                     | 120          |
| Northborough .....                         | Bost., Clinton & Fitch. R. R. ....     | 296          |
| Northbridge .....                          | Prov. & Worces. R. R. ....             | 269          |
| North Dana .....                           | Spring., Athol & North'n R. R. ....    | 462          |
| North Eastham .....                        | Cape Cod R. R. ....                    | 54           |
| North Hatfield .....                       | Conn. River R. R. ....                 | 172          |
| North Wilbraham .....                      | Boston & Albany R. R. ....             | 264          |
| North Wrentham .....                       | Boston & N. Y. R. R. ....              | 222          |
| Oakdale .....                              | Worcester & Nashua R. R. ....          | 382          |
| Old Furnace .....                          | Mass. Cent. R. R. ....                 | 561          |
| Do .....                                   | Boston & Albany R. R. ....             | 581          |
| Orleans .....                              | Cape Cod R. R. ....                    | 44           |
| Palmer .....                               | Boston & Albany R. R. ....             | 336          |
| Pepperill .....                            | Worcester & Nashua R. R. ....          | 205          |
| Pittsfield .....                           | Boston & Albany R. R. ....             | 1,013        |
| Pratt's Junction .....                     | Boston, Clinton & Fitchburg R. R. .... | 429          |
| Quinsigamond Lake .....                    | Toner .....                            | 361          |
| Readville .....                            | Bost. & Prov. R. R. ....               | 61           |
| Rice's Crossing .....                      | Boston & Albany R. R. ....             | 106          |
| Richmond .....                             | Boston & Albany R. R. ....             | 1,047        |

| Station.                                  | Authority.                                | Elevation.   |
|-------------------------------------------|-------------------------------------------|--------------|
|                                           |                                           | <i>Feet.</i> |
| Richmond Furnace .....                    | Boston & Albany R. R. ....                | 1,001        |
| Riverside .....                           | Boston & Albany R. R. ....                | 64           |
| Rochdale .....                            | Boston & Albany R. R. ....                | 721          |
| Roxbury .....                             | Bost. & Prov. R. R. ....                  | 20           |
| Russell .....                             | Boston & Albany R. R. ....                | 273          |
| Rutland Summit .....                      | Mass. Cent. R. R. ....                    | 1,043        |
| Sandwich .....                            | Cape Cod R. R. ....                       | 13           |
| Saundersville .....                       | Prov. & Worces. R. R. ....                | 311          |
| Sawyer's Mills .....                      | Mass. Cent. R. R. ....                    | 301          |
| Shaker Village .....                      | Boston & Albany R. R. ....                | 1,114        |
| Sharon .....                              | Bost. & Prov. R. R. ....                  | 220          |
| Sharon Heights .....                      | Bost. & Prov. R. R. ....                  | 260          |
| Shelburne Falls .....                     | Troy & Greenfield R. R. ....              | 430          |
| Sherborn .....                            | Framingham & Mansfield R. R.              | 171          |
| Shirley .....                             | Fitchburg R. R. ....                      | 282          |
| Smith's .....                             | Spring, Athol & Northern R. R.            | 424          |
| Smith's Ferry .....                       | Conn. River R. R. ....                    | 122          |
| Somerville .....                          | Fitchburg R. R. ....                      | 8            |
| Somerville Centre .....                   | Boston & Lowell R. R. ....                | 34           |
| South Acton .....                         | Fitchburg R. R. ....                      | 199          |
| Southampton .....                         | N. H. & Northampton R. R. ...             | 195          |
| South Ashburnham Junction .....           | Cheshire R. R. ....                       | 1,014        |
| South Athol .....                         | Spring, Athol & Northern R. R.            | 561          |
| Southborough .....                        | Boston, Clinton & Fitchburg<br>R. R. .... | 307          |
| South Dedham .....                        | Boston & N. Y. R. R. ....                 | 141          |
| South Deerfield .....                     | Conn. River R. R. ....                    | 207          |
| South Framingham .....                    | Boston & Albany R. R. ....                | 163          |
| South Lancaster .....                     | Worces. & Nashua R. R. ....               | 272          |
| South Lawrence .....                      | Boston & Maine R. R. ....                 | 49           |
| South Spencer .....                       | Boston & Albany R. R. ....                | 704          |
| Southville .....                          | Boston & Albany R. R. ....                | 263          |
| South Walpole .....                       | Framingham & Mansfield R. R.              | 227          |
| South Wellfleet .....                     | Cape Cod R. R. ....                       | 14           |
| Southwick .....                           | N. H. & Northampton R. R. ...             | 242          |
| South Worcester .....                     | Prov. & Worces. R. R. ....                | 463          |
| Springfield .....                         | Boston & Albany R. R. ....                | 70           |
| Do .... Indian Orchard Station .....      | Boston & Albany R. R. ....                | 175          |
| Do .... Armory Hill Station .....         | N. Y. & N. E. R. R. ....                  | 204          |
| Do .... Signal Station .....              | U. S. Signal Office .....                 | 120          |
| Spring Hill .....                         | Cape Cod R. R. ....                       | 24           |
| State Line, Massachusetts and New York .. | Boston & Albany R. R. ....                | 914          |
| Sterling Junction .....                   | Worcester & Nashua R. R. ....             | 436          |
| Still River .....                         | Worcester & Nashua R. R. ....             | 243          |
| Stone Hill, Williamstown .....            | Appalachian Club .....                    | 1,066        |
| Stony Brook .....                         | Fitchburg R. R. ....                      | 91           |
| Sudbury .....                             | Mass. Cent. R. R. ....                    | 127          |
| Summit Station .....                      | Worces. & Nashua R. R. ....               | 619          |
| Sunderland .....                          | Mass. Cent. R. R. ....                    | 120          |
| Sunset Rock .....                         | Appalachian Club .....                    | 1,992        |
| Sutton .....                              | Prov. & Worces. R. R. ....                | 331          |
| Tatham .....                              | Boston & Albany R. R. ....                | 129          |
| Templeton .....                           | Boston & Albany R. R. ....                | 964          |
| Tewksbury .....                           | Lowell & Andover R. R. ....               | 124          |
| Thatcher's Island, Signal Station .....   | U. S. Signal Office .....                 | 48           |
| Thorndike .....                           | Boston & Albany R. R. ....                | 345          |
| Tom, Mount .....                          | Conn. River R. R. ....                    | 123          |
| Turner's Falls .....                      | N. H. & Northampton R. R. ...             | 170          |
| Uxbridge .....                            | Prov. & Worces. R. R. ....                | 231          |
| Wachusett Mountain .....                  | Guyot .....                               | 2,018        |
| Walpole Junction, B., H. & E. R. R. ....  | Framingham & Mansfield R. R.              | 157          |
| Waltham .....                             | Fitchburg R. R. ....                      | 45           |
| Ware .....                                | Boston & Albany R. R. ....                | 489          |
| Wareham .....                             | Cape Cod R. R. ....                       | 5            |

| Station.                                         | Authority.                          | Elevation.   |
|--------------------------------------------------|-------------------------------------|--------------|
|                                                  |                                     | <i>Feet.</i> |
| Warren .....                                     | Boston & Albany R. R. ....          | 593          |
| Washington .....                                 | Boston & Albany R. R. ....          | 1,437        |
| Waterford .....                                  | Prov. & Worces. R. R. ....          | 188          |
| Waterville .....                                 | Boston & Albany R. R. ....          | 918          |
| Waverly .....                                    | Mass. Cent. R. R. ....              | 132          |
| Wayland .....                                    | Mass. Cent. R. R. ....              | 113          |
| Wellesley .....                                  | Boston & Albany R. R. ....          | 140          |
| Wellfleet .....                                  | Cape Cod R. R. ....                 | 14           |
| West Acton .....                                 | Fitchburg R. R. ....                | 221          |
| West Barnstable .....                            | Cape Cod R. R. ....                 | 37           |
| West Berlin .....                                | Mass. Cent. R. R. ....              | 295          |
| Westborough .....                                | Boston & Albany R. R. ....          | 300          |
| West Boylston .....                              | Worcester & Nashua R. R. ....       | 442          |
| West Brimfield .....                             | Boston & Albany R. R. ....          | 391          |
| West Brookfield .....                            | Boston & Albany R. R. ....          | 604          |
| West Deerfield, junction with T. & G. R. R. .... | Mass. Cent. R. R. ....              | 267          |
| Westfield .....                                  | Boston & Albany R. R. ....          | 147          |
| West Fitchburgh .....                            | Fitchburg R. R. ....                | 539          |
| Westford, Stony Brook R. R. ....                 | N., A. & B. R. R. ....              | 102          |
| West Medford .....                               | Boston & Lowell R. R. ....          | 21           |
| Westminster .....                                | Fitchburg R. R. ....                | 704          |
| West Newton .....                                | Boston & Albany R. R. ....          | 55           |
| Weston .....                                     | Mass. Cent. R. R. ....              | 65           |
| Do .....                                         | Fitchburg R. R. ....                | 95           |
| West Springfield .....                           | Boston & Albany R. R. ....          | 100          |
| West Walpole .....                               | Boston & N. Y. R. R. ....           | 211          |
| West Ware .....                                  | Spring, Athol & Northern R. R. .... | 387          |
| West Warren .....                                | Boston & Albany R. R. ....          | 514          |
| Whately .....                                    | Conn. River R. R. ....              | 186          |
| Whitins .....                                    | Prov. & Worces. R. R. ....          | 263          |
| Whitney's .....                                  | Boston & Albany R. R. ....          | 166          |
| Williamsburgh .....                              | N. H. & Northampton R. R. ....      | 492          |
| Williams College, old observatory .....          | Appalachian Club .....              | 708          |
| Williamstown .....                               | Troy & Greenfield R. R. ....        | 580          |
| Williamsville .....                              | Boston & Albany R. R. ....          | 833          |
| Willimansett .....                               | Conn. River R. R. ....              | 77           |
| Wilmington .....                                 | Boston & Lowell R. R. ....          | 97           |
| Wilmington Junction .....                        | Boston & Maine R. R. ....           | 88           |
| Winchendon .....                                 | Boston & Albany R. R. ....          | 993          |
| Winchester .....                                 | Bost., Lowell & Nashua R. R. ....   | 27           |
| Wood's Holl, Signal Station .....                | Signal Office .....                 | 35           |
| Worcester, Union Station .....                   | Boston & Albany R. R. ....          | 473          |
| Do.....Lincoln Square Station .....              | Boston & Albany R. R. ....          | 475          |
| Do.....South Worcester Junction .....            | Boston & Albany R. R. ....          | 477          |
| Yarmouth .....                                   | Cape Cod R. R. ....                 | 40           |



# MICHIGAN.

| Station.                                              | Authority.                | Elevation.   |
|-------------------------------------------------------|---------------------------|--------------|
|                                                       |                           | <i>Feet.</i> |
| Abronia.....                                          | L. S. & M. S. R. R.....   | 714          |
| Ada.....                                              | D., G. H. & M. R. R.....  | 666          |
| Adrian.....                                           | L. S. & M. S. R. R.....   | 810          |
| Alamo.....                                            | K. & S. H. R. R.....      | 765          |
| Alba.....                                             | G. R. & Ind. R. R.....    | 1,177        |
| Albion.....                                           | Mich. Cent. R. R.....     | 943          |
| Allegan.....                                          | L. S. & M. S. R. R.....   | 708          |
| Allen's.....                                          | L. S. & M. S. R. R.....   | 1,064        |
| Alpena, Signal Station.....                           | U. S. Signal Office.....  | 609          |
| Amadore.....                                          | P. H. & N. W. R. R.....   | 756          |
| Anderson.....                                         | P. H. & N. W. R. R.....   | 742          |
| Ann Arbor.....                                        | Mich. Cent. R. R.....     | 771          |
| Argenta.....                                          | L. S. & M. S. R. R.....   | 772          |
| Arland.....                                           | G. R. V. R. R.....        | 941          |
| Ashton.....                                           | G. R. & Ind. R. R.....    | 1,152        |
| Attica.....                                           | C. & G. T. R. R.....      | 896          |
| Augusta.....                                          | Mich. Cent. R. R.....     | 789          |
| Austin Lake.....                                      | G. R. & Ind. R. R.....    | 862          |
| Avery's.....                                          | Mich. Cent. R. R.....     | 655          |
| Bagley.....                                           | J., L. & S. R. R.....     | 1,285        |
| Bald Tom, Geodetic Station.....                       | U. S. Lake Survey.....    | 822          |
| Baldwin's.....                                        | Ft. W., J. & S. R. R..... | 1,011        |
| Do....surface water in north branch<br>Kalamazoo..... | Ft. W., J. & S. R. R..... | 1,002        |
| Balmer's.....                                         | P. H. & N. W. R. R.....   | 744          |
| Bancroft.....                                         | C. & G. T. R. R.....      | 856          |
| Bancroft.....                                         | M., H. & O. R. R.....     | 936          |
| Bankers.....                                          | Ft. W., J. & S. R. R..... | 1,067        |
| Barron Lake.....                                      | Mich. A. L. R. R.....     | 768          |
| Batavia.....                                          | L. S. & M. S. R. R.....   | 946          |
| Battle Creek.....                                     | Mich. Cent. R. R.....     | 819          |
| Bay City.....                                         | D. & B. C. R. R.....      | 592          |
| Do.. Junction.....                                    | D. & B. C. R. R.....      | 604          |
| Bay View.....                                         | G. R. & Ind. R. R.....    | 616          |
| Beaver Lake.....                                      | J., L. & S. R. R.....     | 1,254        |
| Bedford.....                                          | Mich. Cent. R. R.....     | 809          |
| Do.. Geodetic Station.....                            | U. S. Lake Survey.....    | 679          |
| Belmont.....                                          | G. R. & Ind. R. R.....    | 661          |
| Belsay.....                                           | C. & G. T. R. R.....      | 777          |
| Benedicts.....                                        | A. & D. R. R.....         | 900          |
| Berlamont.....                                        | K. & S. H. R. R.....      | 700          |
| Berlin.....                                           | D., G. H. & M. R. R.....  | 687          |
| Bertrand, Geodetic Station.....                       | U. S. Lake Survey.....    | 949          |
| Big Rapids.....                                       | G. R. & Ind. R. R.....    | 916          |
| Do.... G. R. & I. crossing.....                       | D., L. & N. R. R.....     | 1,001        |
| Birmingham.....                                       | D., G. H. & M. R. R.....  | 779          |
| Blanchard.....                                        | D., L. & N. R. R.....     | 930          |
| Blissfield.....                                       | L., S. & M. S. R. R.....  | 684          |
| Do.. Geodetic Station.....                            | U. S. Lake Survey.....    | 687          |
| Bloomingdale.....                                     | K. & S. H. R. R.....      | 731          |
| Bond's Mill.....                                      | G. R. & Ind. R. R.....    | 1,416        |
| Boston Mine.....                                      | M., H. & O. R. R.....     | 1,502        |
| Bowen.....                                            | G. R. V. R. R.....        | 734          |
| Boyne Falls.....                                      | G. R. & Ind. R. R.....    | 712          |
| Bradley.....                                          | G. R. & Ind. R. R.....    | 757          |
| Brighton.....                                         | D., L. & N. R. R.....     | 929          |
| Bronson.....                                          | L. S. & M. S. R. R.....   | 927          |
| Do.. Geodetic Station.....                            | U. S. Lake Survey.....    | 996          |

| Station.                            | Authority.                      | Elevation.   |
|-------------------------------------|---------------------------------|--------------|
|                                     |                                 | <i>Feet.</i> |
| Brownells .....                     | K. & S. H. R. R. ....           | 938          |
| Bruce .....                         | M., H. & O. R. R. ....          | 1,258        |
| Buchanan .....                      | Mich. Cent. R. R. ....          | 733          |
| Bunday, Geodetic Station .....      | U. S. Lake Survey .....         | 1,284        |
| Burlington .....                    | Mich. A. L. R. R. ....          | 947          |
| Burnt Bluff, Geodetic Station ..... | U. S. Lake Survey .....         | 817          |
| Burr Oak .....                      | L. S. & M. S. R. R. ....        | 896          |
| Byers .....                         | G. R. & Ind. R. R. ....         | 902          |
| Byron Centre .....                  | L. S. & M. S. R. R. ....        | 740          |
| Cadillac .....                      | G. R. & Ind. R. R. ....         | 1,292        |
| Caledonia .....                     | G. R. V. R. R. ....             | 799          |
| Calumet .....                       | M. R. R. R. ....                | 1,228        |
| Calvin, Geodetic Station .....      | U. S. Lake Survey .....         | 1,011        |
| Capac .....                         | C. & G. T. R. R. ....           | 817          |
| Carlisle, Geodetic Station .....    | U. S. Lake Survey .....         | 914          |
| Carp .....                          | M., H. & O. R. R. ....          | 1,400        |
| Carpenters .....                    | D. & B. C. R. R. ....           | 801          |
| Carp River Furnace .....            | M., H. & O. R. R. ....          | 625          |
| Carsonville .....                   | C., D. & C. G. T. J. R. R. .... | 768          |
| Caesopolis .....                    | Mich. A. L. R. R. ....          | 881          |
| Cedar Springs .....                 | G. R. & Ind. R. R. ....         | 846          |
| Centerville .....                   | Mich. A. L. R. R. ....          | 813          |
| Ceresco .....                       | Mich. Cent. R. R. ....          | 892          |
| Chadwick .....                      | D., L. & N. R. R. ....          | 856          |
| Champion .....                      | M., H. & O. R. R. ....          | 1,597        |
| Do. Mine .....                      | M., H. & O. R. R. ....          | 1,715        |
| Charlesworth .....                  | L., S. & M. S. R. R. ....       | 916          |
| Charlotte .....                     | G. R. V. R. R. ....             | 906          |
| Chelsea .....                       | Mich. Cent. R. R. ....          | 913          |
| Cheney .....                        | J., L. & S. R. R. ....          | 1,203        |
| Chesaning .....                     | J., L. & S. R. R. ....          | 632          |
| Chester .....                       | G. R. V. R. R. ....             | 833          |
| Chicago Junction .....              | D., L. & N. R. R. ....          | 874          |
| Child's Mill .....                  | G. R. & Ind. R. R. ....         | 680          |
| Chowlay .....                       | D., M. & M. R. R. ....          | 617          |
| Clarendon .....                     | Mich. A. L. R. R. ....          | 966          |
| Clarksburg .....                    | M., H. & O. R. R. ....          | 1,544        |
| Clarkston .....                     | D., G. H. & M. R. R. ....       | 1,008        |
| Clayton .....                       | L. S. & M. S. R. R. ....        | 905          |
| Cleveland Mine .....                | M., H. & O. R. R. ....          | 1,427        |
| Cliff's Siding .....                | M., H. & O. R. R. ....          | 1,661        |
| Clinton .....                       | L. S. & M. S. R. R. ....        | 832          |
| Clyde .....                         | J., L. & S. R. R. ....          | 767          |
| Colbys .....                        | D., L. & N. R. R. ....          | 867          |
| Coldwater .....                     | L., S. & M. S. R. R. ....       | 983          |
| Collins .....                       | D. L. & N. R. R. ....           | 777          |
| Colon .....                         | Mich. A. L. R. R. ....          | 838          |
| Columbia .....                      | K. & S. H. R. R. ....           | 682          |
| Columbia and Kloman Mine .....      | M. H. & O. R. R. ....           | 1,510        |
| Columbiaville .....                 | D. & B. C. R. R. ....           | 777          |
| Colwell .....                       | D., L. & N. R. R. ....          | 914          |
| Comstock .....                      | Mich. Cent. R. R. ....          | 782          |
| Concord .....                       | Mich. A. L. R. R. ....          | 987          |
| Condit .....                        | L. S. & M. S. R. R. ....        | 952          |
| Conger .....                        | G. R. & Ind. R. R. ....         | 912          |
| Constantine .....                   | L. S. & M. S. R. R. ....        | 803          |
| Cooper .....                        | G. R. & Ind. R. R. ....         | 772          |
| Do .....                            | L. S. & M. S. R. R. ....        | 749          |
| Coopersville .....                  | D., G. H. & M. R. R. ....       | 646          |
| Coral .....                         | D., L. & N. R. R. ....          | 897          |
| Coreys .....                        | Mich. A. L. R. R. ....          | 871          |
| Corunna .....                       | D., G. H. & M. R. R. ....       | 776          |
| Crapo .....                         | C. & G. T. R. R. ....           | 777          |
| Crofton .....                       | G. R. & Ind. R. R. ....         | 1,040        |

| Station.                                         | Authority.                      | Elevation.   |
|--------------------------------------------------|---------------------------------|--------------|
|                                                  |                                 | <i>Feet.</i> |
| Crosswell .....                                  | P. H. & N. W. R. R. ....        | 730          |
| Daileys .....                                    | Mich. A. L. R. R. ....          | 871          |
| Dalliba Mine .....                               | M. H. & O. R. R. ....           | 1,726        |
| Dana .....                                       | D., L. & N. R. R. ....          | 897          |
| Danby .....                                      | D., L. & N. R. R. ....          | 782          |
| Davisburgh .....                                 | D., G. H. & M. R. R. ....       | 959          |
| Davison .....                                    | C. & G. T. R. R. ....           | 791          |
| Dayton .....                                     | Mich. Cent. R. R. ....          | 718          |
| Dearborn .....                                   | Mich. Cent. R. R. ....          | 614          |
| Decatur .....                                    | Mich. Cent. R. R. ....          | 781          |
| Deerfield .....                                  | L. S. & M. S. R. R. ....        | 670          |
| Delta .....                                      | D., L. & N. R. R. ....          | 867          |
| Dennison .....                                   | D., G. H. & M. R. R. ....       | 640          |
| Dentons .....                                    | Mich. Cent. R. R. ....          | 703          |
| Detroit .....                                    | Mich. Cent. R. R. ....          | 581          |
| Do Signal Station .....                          | U. S. Signal Office. ....       | 661          |
| Devereux .....                                   | L. S. & M. S. R. R. ....        | 990          |
| Dexter .....                                     | Mich. Cent. R. R. ....          | 858          |
| Dickson .....                                    | D., L. & N. R. R. ....          | 897          |
| Dimondale Crossing .....                         | L. S. & M. S. R. R. ....        | 860          |
| Divide, Geodetic Station .....                   | U. S. Lake Survey. ....         | 1,029        |
| Dorr .....                                       | L. S. & M. S. R. R. ....        | 696          |
| Dowagiac .....                                   | Mich. Cent. R. R. ....          | 760          |
| Drayton Plains .....                             | D., G. H. & M. R. R. ....       | 967          |
| Dundee, Geodetic Station .....                   | U. S. Lake Survey. ....         | 681          |
| Durand .....                                     | D., G. H. & M. R. R. ....       | 801          |
| Do Crossing D. G. H. & M. R. R.<br>(grade) ..... | C. & G. T. R. R. ....           | 797          |
| Durton .....                                     | D., M. & M. R. R. ....          | 752          |
| Eagle .....                                      | D., L. & N. R. R. ....          | 861          |
| Eagle Mill .....                                 | M., H. & O. R. R. ....          | 1,280        |
| Eagle Mills .....                                | L. S. & M. S. R. R. ....        | 601          |
| East Saginaw .....                               | J., L. & S. R. R. ....          | 588          |
| Eaton Rapids .....                               | G. R. V. R. R. ....             | 876          |
| Do G. R. V. R. R. crossing .....                 | L. S. & M. S. R. R. ....        | 864          |
| Edgeton .....                                    | G. R. & Ind. R. R. ....         | 755          |
| Edmore .....                                     | D., L. & N. R. R. ....          | 946          |
| Edwards Mine .....                               | M., H. & O. R. R. ....          | 1,544        |
| Elba .....                                       | C. & G. T. R. R. ....           | 859          |
| Elmira .....                                     | G. R. & Ind. R. R. ....         | 1,234        |
| Elmwood .....                                    | D. L. & N. R. R. ....           | 638          |
| Emmet .....                                      | C. & G. T. R. R. ....           | 779          |
| Empire Mine .....                                | M., H. & O. R. R. ....          | 1,571        |
| Escanaba, Signal Station .....                   | U. S. Signal Office. ....       | 612          |
| Excelsior Furnace .....                          | M. H. & O. R. R. ....           | 1,447        |
| Fairfield, Geodetic Station .....                | U. S. Lake Survey. ....         | 799          |
| Fenton .....                                     | D., G. H. & M. R. R. ....       | 909          |
| Fenwick .....                                    | D., L. & N. R. R. ....          | 848          |
| Ferrysburgh .....                                | D., G. H. & M. R. R. ....       | 596          |
| Fishdam River, Geodetic Station .....            | U. S. Lake Survey. ....         | 866          |
| Fisher .....                                     | G. R. & Ind. R. R. ....         | 682          |
| Fishers .....                                    | D., L. & N. R. R. ....          | 631          |
| Fleming .....                                    | D., L. & N. R. R. ....          | 934          |
| Flint .....                                      | C. & G. T. R. R. ....           | 715          |
| Flowerfield .....                                | L. S. & M. S. R. R. ....        | 864          |
| Forrest .....                                    | J., L. & S. R. R. ....          | 1,286        |
| Fowler .....                                     | D., G. H. & M. R. R. ....       | 748          |
| Fowlerville .....                                | D., L. & N. R. R. ....          | 902          |
| Francisco .....                                  | Mich. Cent. R. R. ....          | 1,016        |
| Frazer .....                                     | C., D. & C. G. T. J. R. R. .... | 604          |
| Fyfe Lake .....                                  | G. R. & Ind. R. R. ....         | 1,019        |
| Gaines .....                                     | D., G. H. & M. R. R. ....       | 859          |
| Galesburgh .....                                 | Mich. Cent. R. R. ....          | 788          |
| Gallon .....                                     | Mich. Cent. R. R. ....          | 682          |

| Station.                            | Authority.                      | Elevation.   |
|-------------------------------------|---------------------------------|--------------|
|                                     |                                 | <i>Feet.</i> |
| Brownells .....                     | K. & S. H. R. R. ....           | 938          |
| Bruce .....                         | M., H. & O. R. R. ....          | 1,258        |
| Buchanan .....                      | Mich. Cent. R. R. ....          | 733          |
| Bunday, Geodetic Station .....      | U. S. Lake Survey .....         | 1,284        |
| Burlington .....                    | Mich. A. L. R. R. ....          | 947          |
| Burnt Bluff, Geodetic Station ..... | U. S. Lake Survey .....         | 817          |
| Burr Oak .....                      | L. S. & M. S. R. R. ....        | 896          |
| Byers .....                         | G. R. & Ind. R. R. ....         | 902          |
| Byron Centre .....                  | L. S. & M. S. R. R. ....        | 740          |
| Cadillac .....                      | G. R. & Ind. R. R. ....         | 1,292        |
| Caledonia .....                     | G. R. V. R. R. ....             | 799          |
| Calumet .....                       | M. R. R. R. ....                | 1,228        |
| Calvin, Geodetic Station .....      | U. S. Lake Survey .....         | 1,011        |
| Capac .....                         | C. & G. T. R. R. ....           | 817          |
| Carlisle, Geodetic Station .....    | U. S. Lake Survey .....         | 914          |
| Carp .....                          | M., H. & O. R. R. ....          | 1,400        |
| Carpenters .....                    | D. & B. C. R. R. ....           | 801          |
| Carp River Furnace .....            | M., H. & O. R. R. ....          | 625          |
| Carsonville .....                   | C., D. & C. G. T. J. R. R. .... | 768          |
| Cassopolis .....                    | Mich. A. L. R. R. ....          | 881          |
| Cedar Springs .....                 | G. R. & Ind. R. R. ....         | 846          |
| Centerville .....                   | Mich. A. L. R. R. ....          | 813          |
| Ceresco .....                       | Mich. Cent. R. R. ....          | 892          |
| Chadwick .....                      | D., L. & N. R. R. ....          | 856          |
| Champion .....                      | M., H. & O. R. R. ....          | 1,597        |
| Do... Mine .....                    | M., H. & O. R. R. ....          | 1,715        |
| Charlesworth .....                  | L., S. & M. S. R. R. ....       | 916          |
| Charlotte .....                     | G. R. V. R. R. ....             | 906          |
| Chelsea .....                       | Mich. Cent. R. R. ....          | 913          |
| Cheney .....                        | J., L. & S. R. R. ....          | 1,203        |
| Chesaning .....                     | J., L. & S. R. R. ....          | 632          |
| Chester .....                       | G. R. V. R. R. ....             | 833          |
| Chicago Junction .....              | D., L. & N. R. R. ....          | 874          |
| Child's Mill .....                  | G. R. & Ind. R. R. ....         | 680          |
| Chowlay .....                       | D., M. & M. R. R. ....          | 617          |
| Clarendon .....                     | Mich. A. L. R. R. ....          | 966          |
| Clarksburg .....                    | M., H. & O. R. R. ....          | 1,544        |
| Clarkston .....                     | D., G. H. & M. R. R. ....       | 1,008        |
| Clayton .....                       | L. S. & M. S. R. R. ....        | 905          |
| Cleveland Mine .....                | M., H. & O. R. R. ....          | 1,427        |
| Cliff's Siding .....                | M., H. & O. R. R. ....          | 1,661        |
| Clinton .....                       | L. S. & M. S. R. R. ....        | 832          |
| Clyde .....                         | J., L. & S. R. R. ....          | 767          |
| Collins .....                       | D., L. & N. R. R. ....          | 867          |
| Collins .....                       | L., S. & M. S. R. R. ....       | 983          |
| Collins .....                       | D. L. & N. R. R. ....           | 777          |
| Colon .....                         | Mich. A. L. R. R. ....          | 838          |
| Columbia .....                      | K. & S. H. R. R. ....           | 682          |
| Columbia and Kroman Mine .....      | M. H. & O. R. R. ....           | 1,510        |
| Columbiaville .....                 | D. & B. C. R. R. ....           | 777          |
| Colwell .....                       | D., L. & N. R. R. ....          | 914          |
| Comstock .....                      | Mich. Cent. R. R. ....          | 782          |
| Concord .....                       | Mich. A. L. R. R. ....          | 987          |
| Condit .....                        | L. S. & M. S. R. R. ....        | 952          |
| Conger .....                        | G. R. & Ind. R. R. ....         | 912          |
| Constantine .....                   | L. S. & M. S. R. R. ....        | 803          |
| Cooper .....                        | G. R. & Ind. R. R. ....         | 772          |
| Do .....                            | L. S. & M. S. R. R. ....        | 749          |
| Coopersville .....                  | D., G. H. & M. R. R. ....       | 646          |
| Coral .....                         | D., L. & N. R. R. ....          | 897          |
| Coreys .....                        | Mich. A. L. R. R. ....          | 871          |
| Corunna .....                       | D., G. H. & M. R. R. ....       | 776          |
| Crapo .....                         | C. & G. T. R. R. ....           | 777          |
| Crofton .....                       | G. R. & Ind. R. R. ....         | 1,040        |

| Station.                                               | Authority.                | Elevation.   |
|--------------------------------------------------------|---------------------------|--------------|
|                                                        |                           | <i>Feet.</i> |
| Jeddo.....                                             | P., H. & N. W. R. R.....  | 737          |
| Jones.....                                             | Mich. A. L. R. R.....     | 916          |
| Jonesville.....                                        | L., S. & M. S. R. R.....  | 1,097        |
| Do.....                                                | Ft. W., J. & S. R. R..... | 1,056        |
| Do..... crossing of L. S. & M. S. R. R., old line..... | Ft. W., J. & S. R. R..... | 1,077        |
| Kalamazoo.....                                         | L. S. & M. S. R. R.....   | 777          |
| Kalkaska.....                                          | G. R. & Ind. R. R.....    | 1,022        |
| Kawkawlin.....                                         | J., L. & S. R. R.....     | 597          |
| Kendall.....                                           | K. & S. H. R. R.....      | 792          |
| Keystone Mine.....                                     | M., H. & O. R. R.....     | 1,667        |
| Kiddville.....                                         | D., L. & N. R. R.....     | 802          |
| Kingsley.....                                          | P. H. & N. W. R. R.....   | 736          |
| Klinger Lake.....                                      | L. S. & M. S. R. R.....   | 890          |
| Lake Superior Mine.....                                | M., H. & O. R. R.....     | 1,447        |
| Laingsburg.....                                        | J., L. & S. R. R.....     | 806          |
| L'Anse.....                                            | M., H. & O. R. R.....     | 608          |
| Lansing.....                                           | J., L. & S. R. R.....     | 852          |
| Do.....                                                | L. S. & M. S. R. R.....   | 827          |
| Do.....                                                | C. & G. T. R. R.....      | 840          |
| Lapeer.....                                            | C. & G. T. R. R.....      | 830          |
| Lawton.....                                            | Mich. Cent. R. R.....     | 778          |
| Leelsville.....                                        | G. R. & Ind. R. R.....    | 1,050        |
| Lenawee Junction.....                                  | L. S. & M. S. R. R.....   | 714          |
| Leoni.....                                             | Mich. Cent. R. R.....     | 980          |
| Leroy.....                                             | G. R. & Ind. R. R.....    | 1,232        |
| Linden.....                                            | D., G. H. & M. R. R.....  | 874          |
| Litchfield.....                                        | L. S. & M. S. R. R.....   | 1,007        |
| Livonia.....                                           | D., L. & N. R. R.....     | 669          |
| Lockwood.....                                          | G. R. & Ind. R. R.....    | 882          |
| Lowell.....                                            | D., G. H. & M. R. R.....  | 641          |
| Lowthian Mine.....                                     | M., H. & O. R. R.....     | 1,497        |
| Lyons.....                                             | D., L. & N. R. R.....     | 734          |
| McBride's.....                                         | D., L. & N. R. R.....     | 942          |
| McKay's Mountain.....                                  | Foster & Whitney.....     | 1,627        |
| McKinnie's.....                                        | D., L. & N. R. R.....     | 647          |
| McOmber Mine.....                                      | M., H. & O. R. R.....     | 1,458        |
| Macon.....                                             | A. & D. R. R.....         | 870          |
| Magnetic Mine.....                                     | M., H. & O. R. R.....     | 1,563        |
| Mancelona.....                                         | G. R. & Ind. R. R.....    | 1,119        |
| Manchester.....                                        | L. S. & M. S. R. R.....   | 907          |
| Manganese Mine.....                                    | M., H. & O. R. R.....     | 1,503        |
| Mangers.....                                           | D. & B. C. R. R.....      | 597          |
| Manton.....                                            | G. R. & Ind. R. R.....    | 1,142        |
| Maple Valley.....                                      | D., L. & N. R. R.....     | 925          |
| Marengo.....                                           | Mich. Cent. R. R.....     | 921          |
| Marquette.....                                         | M., H. & O. R. R.....     | 649          |
| Do.....                                                | D., M. & M. R. R.....     | 622          |
| Do..... Signal Station.....                            | U. S. Signal Office.....  | 673          |
| Marshall.....                                          | Mich. Cent. R. R.....     | 898          |
| Marshfield.....                                        | D., L. & N. R. R.....     | 1,011        |
| Martin.....                                            | G. R. & Ind. R. R.....    | 827          |
| Mason.....                                             | J., L. & S. R. R.....     | 883          |
| Mattawan.....                                          | Mich. Cent. R. R.....     | 860          |
| Mecosta.....                                           | D., L. & N. R. R.....     | 962          |
| Melrose.....                                           | G. R. & Ind. R. R.....    | 677          |
| Mendon.....                                            | G. R. & Ind. R. R.....    | 842          |
| Meridian.....                                          | C. & G. T. R. R.....      | 850          |
| Do.....                                                | D., L. & N. R. R.....     | 885          |
| Mesnard, Geodetic Station.....                         | U. S. Lake Survey.....    | 1,124        |
| Metamora.....                                          | D. & B. C. R. R.....      | 1,055        |
| Michigamme.....                                        | M., H. & O. R. R.....     | 1,584        |
| Michigamme Mine.....                                   | M., H. & O. R. R.....     | 1,552        |
| Michigau Furnace.....                                  | M., H. & O. R. R.....     | 1,537        |

| Station.                           | Authority.                      | Elevation.   |
|------------------------------------|---------------------------------|--------------|
|                                    |                                 | <i>Feet.</i> |
| Michigan, Lake .....               | U. S. Lake Survey .....         | 582          |
| Middleville .....                  | G. R. V. R. R. ....             | 717          |
| Millbrook .....                    | D., L. & N. R. R. ....          | 938          |
| Mill Creek .....                   | G. R. & Ind. R. R. ....         | 625          |
| Millington .....                   | D. & B. C. R. R. ....           | 757          |
| Milton, Geodetic Station .....     | U. S. Lake Survey .....         | 896          |
| Milwaukee Junction .....           | Grand Trunk R. R. ....          | 625          |
| Milwaukee Mine .....               | M., H. & O. R. R. ....          | 1,562        |
| Moline .....                       | G. R. & Ind. R. R. ....         | 785          |
| Monistique, Geodetic Station ..... | U. S. Lake Survey .....         | 997          |
| Monroe, Geodetic Station .....     | U. S. Lake Survey .....         | 626          |
| Monroe Junction .....              | L. S. & M. S. R. R. ....        | 579          |
| Montague, water-tank .....         | C. & M. L. S. R. R. ....        | 587          |
| Monteith .....                     | G. R. & Ind. R. R. ....         | 828          |
| Montgomery .....                   | Ft. W., J. & S. R. R. ....      | 1,035        |
| Moore Park .....                   | L., S. & M. S. R. R. ....       | 842          |
| Morley .....                       | G., R. & Ind. R. R. ....        | 887          |
| Morrice .....                      | C. & G. T. R. R. ....           | 890          |
| Moshville .....                    | Ft. W., J. & S. R. R. ....      | 1,015        |
| Mount Clemens .....                | C. D. & C. G. T. J. R. R. ....  | 602          |
| Mud Lake, Geodetic Station .....   | U. S. Lake Survey .....         | 1,005        |
| Muir .....                         | D., G. H. & M. R. R. ....       | 657          |
| Muskegon, water-tank .....         | C. & M. L. S. R. R. ....        | 594          |
| Napoleon .....                     | L. S. & M. S. R. R. ....        | 964          |
| Nashville .....                    | G. R. V. R. R. ....             | 807          |
| Negaunee .....                     | M., H. & O. R. R. ....          | 1,379        |
| New Buffalo .....                  | Mich. Cent. R. R. ....          | 602          |
| New Haven .....                    | C., D. & C. G. T. J. R. R. .... | 617          |
| Newport .....                      | L. S. & M. S. R. R. ....        | 584          |
| Niles .....                        | Mich. Cent. R. R. ....          | 681          |
| Do Junction .....                  | Mich. A. L. R. R. ....          | 697          |
| Norris .....                       | D. & B. C. R. R. ....           | 631          |
| Northampton Mine .....             | M., H. & O. R. R. ....          | 1,675        |
| North Concord .....                | Mich. Cent. R. R. ....          | 968          |
| North Lansing .....                | D., L. & N. R. R. ....          | 852          |
| Nottawa .....                      | G. R. & Ind. R. R. ....         | 852          |
| Nowell .....                       | L. S. & M. S. R. R. ....        | 942          |
| Nudica .....                       | C. & M. L. S. R. R. ....        | 631          |
| Oakeet .....                       | C. & G. T. R. R. ....           | 874          |
| Odlams .....                       | P. H. & N. W. R. R. ....        | 730          |
| Ogemaw .....                       | J., L. & S. R. R. ....          | 1,088        |
| Okemos .....                       | D., L. & N. R. R. ....          | 874          |
| Onondaga .....                     | G. R. V. R. R. ....             | 895          |
| Ontonagon Junction .....           | M., H. & O. R. R. ....          | 1,434        |
| Orion .....                        | D. & B. C. R. R. ....           | 995          |
| Orono .....                        | G., R. & Ind. R. R. ....        | 1,072        |
| Osseo .....                        | L. S. & M. S. R. R. ....        | 1,126        |
| Ostemo .....                       | Mich. Cent. R. R. ....          | 962          |
| Otsego .....                       | L. S. & M. S. R. R. ....        | 710          |
| Ottawa Lake .....                  | L. S. & M. S. R. R. ....        | 683          |
| Otterburn .....                    | C. & G. T. R. R. ....           | 774          |
| Otter Lake .....                   | D. & B. C. R. R. ....           | 869          |
| Ovid .....                         | D., G. H. & M. R. R. ....       | 735          |
| Owosso .....                       | D., G. H. & M. R. R. ....       | 745          |
| Oxford .....                       | D. & B. C. R. R. ....           | 1,058        |
| Pacific Furnace .....              | M., H. & O. R. R. ....          | 622          |
| Palmer .....                       | D., L. & N. R. R. ....          | 868          |
| Palmyra .....                      | L. S. & M. S. R. R. ....        | 707          |
| Paris .....                        | G. R. & Ind. R. R. ....         | 927          |
| Parma .....                        | Mich. Cent. R. R. ....          | 986          |
| Parmalee .....                     | G. R. V. R. R. ....             | 713          |
| Pentwater, turn-table .....        | C. & M. L. S. R. R. ....        | 595          |
| Perrin .....                       | G. R. & Ind. R. R. ....         | 872          |
| Perry .....                        | C. & G. T. R. R. ....           | 892          |

| Station.                                                | Authority.                  | Elevation.   |
|---------------------------------------------------------|-----------------------------|--------------|
|                                                         |                             | <i>Feet.</i> |
| Petersburgh .....                                       | L. S. & M. S. R. R. ....    | 670          |
| Petoskey .....                                          | G. R. & Ind. R. R. ....     | 658          |
| Pewamo .....                                            | D., G., H. & M. R. R. ....  | 744          |
| Pierson .....                                           | G. R. & Ind. R. R. ....     | 906          |
| Pinconning .....                                        | J., L. & S. R. R. ....      | 599          |
| Pine Grove .....                                        | K. & S. H. R. R. ....       | 777          |
| Pine Lake .....                                         | C. & G. T. R. R. ....       | 859          |
| Pioneer Furnace .....                                   | M., H. & O. R. R. ....      | 1,382        |
| Pittsburgh Lake, Angeline Mine .....                    | M., H. & O. R. R. ....      | 1,442        |
| Pittsford .....                                         | L. S. & M. S. R. R. ....    | 1,109        |
| Do. Geodetic Station .....                              | U. S. Lake Survey .....     | 1,149        |
| Plainwell .....                                         | L. S. & M. S. R. R. ....    | 744          |
| Plymouth .....                                          | D., L. & N. R. R. ....      | 747          |
| Pokagon .....                                           | Mich. Cent. R. R. ....      | 733          |
| Pontiac .....                                           | D., G., H. & M. R. R. ....  | 934          |
| Do. Stanley Station crossing, O. & Pt.<br>A. R. R. .... | C. & G. T. R. R. ....       | 897          |
| Porcupine Mountain, Geodetic Station ....               | U. S. Lake Survey .....     | 2,023        |
| Portage .....                                           | L. S. & M. S. R. R. ....    | 860          |
| Portage Lake .....                                      | G. R. & Ind. R. R. ....     | 834          |
| Porter, Geodetic Station .....                          | U. S. Lake Survey .....     | 950          |
| Port Huron, Signal Station .....                        | U. S. Signal Office .....   | 633          |
| Portland .....                                          | D., L. & N. R. R. ....      | 730          |
| Pulaski .....                                           | Mich. A. L. R. R. ....      | 1,043        |
| Quimby .....                                            | G. R. V. R. R. ....         | 794          |
| Quincy .....                                            | L. S. & M. S. R. R. ....    | 1,027        |
| Do. Geodetic Station .....                              | U. S. Lake Survey .....     | 1,061        |
| Rack's Mills .....                                      | C. D. & C. G. T. R. R. .... | 759          |
| Raisin .....                                            | A. & D. R. R. ....          | 862          |
| Do. Geodetic Station .....                              | U. S. Lake Survey .....     | 851          |
| Reading .....                                           | Ft. W., J. & S. R. R. ....  | 1,200        |
| Do. Geodetic Station .....                              | U. S. Lake Survey .....     | 1,209        |
| Redford .....                                           | D. L. & N. R. R. ....       | 631          |
| Reed City .....                                         | G. R. & Ind. R. R. ....     | 1,027        |
| Reese .....                                             | D. & B. C. R. R. ....       | 629          |
| Remick .....                                            | D. L. & N. R. R. ....       | 934          |
| Republic .....                                          | M. H. & O. R. R. ....       | 1,510        |
| Republic Mine .....                                     | M. H. & O. R. R. ....       | 1,536        |
| Riga .....                                              | L. S. & M. S. R. R. ....    | 692          |
| Rives' Junction .....                                   | G. R. V. R. R. ....         | 904          |
| Rochester .....                                         | D. & B. C. R. R. ....       | 747          |
| Rockford .....                                          | G. R. & Ind. R. R. ....     | 689          |
| Rockwood .....                                          | L. S. & M. S. R. R. ....    | 582          |
| Rodney .....                                            | D. L. & N. R. R. ....       | 1,062        |
| Rolling Mill Mine .....                                 | M. H. & O. R. R. ....       | 1,402        |
| Roscommon .....                                         | J., L. & S. R. R. ....      | 1,128        |
| Ross .....                                              | G. R. & Ind. R. R. ....     | 777          |
| Royal Oak .....                                         | D., G. H. & M. R. R. ....   | 663          |
| Saganin .....                                           | J., L. & S. R. R. ....      | 616          |
| Saginaw .....                                           | M., H. & O. R. R. ....      | 1,441        |
| Saginaw City .....                                      | J., L. & S. R. R. ....      | 591          |
| Saginaw Mine .....                                      | M., H. & O. R. R. ....      | 1,552        |
| Saint Charles .....                                     | J., L. & S. R. R. ....      | 691          |
| Saint Helens .....                                      | J., L. & S. R. R. ....      | 1,158        |
| Saint John's .....                                      | D., G. H. & M. R. R. ....   | 767          |
| Do. (L. W. of Maumee River) .....                       | Ft. W., J. & S. R. R. ....  | 996          |
| Do. Bridge .....                                        | C. & M. L. S. R. R. ....    | 596          |
| Salem .....                                             | D. L. & N. R. R. ....       | 953          |
| Saline .....                                            | A. & D. R. R. ....          | 889          |
| Sanborn, grade .....                                    | C. & G. T. R. R. ....       | 710          |
| Sand Lake .....                                         | G. R. & Ind. R. R. ....     | 912          |
| Sand River .....                                        | D. M. & M. R. R. ....       | 627          |
| Saranac .....                                           | D., G. H. & M. R. R. ....   | 643          |
| Schoolcraft .....                                       | L. S. & M. S. R. R. ....    | 884          |

| Station.                              | Authority.               | Elevation.   |
|---------------------------------------|--------------------------|--------------|
|                                       |                          | <i>Feet.</i> |
| Scio.....                             | Mich. Cent. R. R.....    | 845          |
| Shafterburg.....                      | C. & G. T. R. R.....     | 879          |
| Shelby Depot.....                     | C. & M. L. S. R. R.....  | 808          |
| Shelbyville.....                      | G. R. & Ind. R. R.....   | 832          |
| Shelter Bay, Geodetic Station.....    | U. S. Lake Survey.....   | 1,054        |
| Shenango Mine.....                    | M. H. & O. R. R.....     | 1,421        |
| Shepardsville.....                    | D., G. H. & M. R. R..... | 749          |
| Sheridan.....                         | D., L. & N. R. R.....    | 856          |
| Do.....                               | G. R. V. R. R.....       | 806          |
| Sherman, Geodetic Station.....        | U. S. Lake Survey.....   | 1,038        |
| Sherwood.....                         | Mich. A. L. R. R.....    | 872          |
| Shiloh.....                           | D., L. & N. R. R.....    | 848          |
| Simons.....                           | G. R. & Ind. R. R.....   | 1,219        |
| Snyder.....                           | Mich. A. L. R. R.....    | 971          |
| South Boardman.....                   | G. R. & Ind. R. R.....   | 1,005        |
| South Haven.....                      | K. & S. H. R. R.....     | 583          |
| South Lansing.....                    | L. S. & M. S. R. R.....  | 807          |
| South Lyon.....                       | D., L. N. R. R.....      | 933          |
| Spinnings.....                        | D. & B. C. R. R.....     | 621          |
| Spring Arbor.....                     | Mich. A. L. R. R.....    | 994          |
| Spring Lake.....                      | D., G. H. & M. R. R..... | 596          |
| Springport.....                       | L. S. & M. S. R. R.....  | 980          |
| Spurr Mine.....                       | M. H. & O. R. R.....     | 1,607        |
| Spurr Mountain.....                   | M. H. & O. R. R.....     | 1,602        |
| Standard Mine.....                    | M. H. & O. R. R.....     | 1,538        |
| Standish.....                         | J., L. & S. R. R.....    | 627          |
| Stanton.....                          | D., L. & N. R. R.....    | 904          |
| Stanton Junction.....                 | D., L. & N. R. R.....    | 821          |
| Stanwood.....                         | G. R. & Ind. R. R.....   | 954          |
| State Road.....                       | J., L. & S. R. R.....    | 602          |
| Stimpson's.....                       | A. & D. R. R.....        | 865          |
| Sterling.....                         | M. H. & O. R. R.....     | 1,567        |
| Steward Mine.....                     | M. H. & O. R. R.....     | 1,602        |
| Sturgeon.....                         | M. H. & O. R. R.....     | 1,643        |
| Sturgeon River, Geodetic Station..... | U. S. Lake Survey.....   | 947          |
| Sturgis.....                          | L. S. & M. S. R. R.....  | 934          |
| Sufield.....                          | C. & G. T. R. R.....     | 783          |
| Superior, Lake.....                   | U. S. Lake Survey.....   | 602          |
| Swartz Creek.....                     | C. & G. T. R. R.....     | 782          |
| Taylor.....                           | M., H. & O. R. R.....    | 1,225        |
| Taylor Mine.....                      | M., H. & O. R. R.....    | 1,516        |
| Tecumseh.....                         | L. S. & M. S. R. R.....  | 807          |
| Tekonsaha.....                        | Mich. A. L. R. R.....    | 937          |
| Terry's.....                          | J., L. & S. R. R.....    | 589          |
| Thomas.....                           | D. & B. C. R. R.....     | 1,093        |
| Three Lakes.....                      | M., H. & O. R. R.....    | 1,616        |
| Three Oaks.....                       | Mich. Cent. R. R.....    | 669          |
| Three Rivers.....                     | L. S. & M. S. R. R.....  | 805          |
| Travis.....                           | G. R. & Ind. R. R.....   | 742          |
| Trenton.....                          | L. S. & M. S. R. R.....  | 584          |
| Tribola, Geodetic Station.....        | U. S. Lake Survey.....   | 1,237        |
| Trowbridge.....                       | C. & G. T. R. R.....     | 851          |
| Trufant's.....                        | D., L. & N. R. R.....    | 884          |
| Tustin.....                           | G. R. & Ind. R. R.....   | 1,212        |
| Union City.....                       | Mich. A. L. R. R.....    | 900          |
| Upper Big Rapids.....                 | G. R. & Ind. R. R.....   | 927          |
| Utica.....                            | D. & B. C. R. R.....     | 650          |
| Vandalia.....                         | Mich. A. L. R. R.....    | 878          |
| Vassar.....                           | D. & B. C. R. R.....     | 643          |
| Vermontville.....                     | G. R. V. R. R.....       | 817          |
| Vernon.....                           | D., G. H. & M. R. R..... | 770          |
| Vicksburg.....                        | G. R. & Ind. R. R.....   | 852          |
| Vulcan, Geodetic Station.....         | U. S. Lake Survey.....   | 1,328        |
| Wagar's.....                          | D., L. & N. R. R.....    | 856          |



| Station.                                   | Authority.                | Elevation.   |
|--------------------------------------------|---------------------------|--------------|
|                                            |                           | <i>Feet.</i> |
| Walton Junction .....                      | G. R. & Ind. R. R .....   | 1,047        |
| Warren .....                               | D. & B. C. R. R .....     | 641          |
| Wasepi .....                               | G. R. & Ind. R. R .....   | 842          |
| Do. (near G. R. & I. R. R. Crossing) ..... | Mich. A. L. R. R .....    | 835          |
| Waterford .....                            | D., G. H. & M. R. R ..... | 988          |
| Wayland .....                              | G. R. & Ind. R. R .....   | 747          |
| Wayne Junction .....                       | Mich. Cent. R. R .....    | 662          |
| Webberville .....                          | D., L. & N. R. R .....    | 892          |
| Wells .....                                | J., L. & S. R. R .....    | 774          |
| Wellesville .....                          | L. S. & M. S. R. R .....  | 690          |
| Wenona .....                               | J., L. & S. R. R .....    | 589          |
| West Branch .....                          | J., L. & S. R. R .....    | 957          |
| Westwood .....                             | G. R. & Ind. R. R .....   | 1,089        |
| Wheal Kate, Geodetic Station .....         | U. S. Lake Survey .....   | 1,508        |
| Wheatland, Geodetic Station .....          | U. S. Lake Survey .....   | 1,248        |
| Wheatland Centre .....                     | D., L. & N. R. R .....    | 1,004        |
| White Feather .....                        | J., L. & S. R. R .....    | 604          |
| White Oaks .....                           | Mich. Cent. R. R .....    | 842          |
| White Pigeon .....                         | L. S. & M. S. R. R .....  | 824          |
| Whites .....                               | Mich. Cent. R. R .....    | 900          |
| Wibber Summit .....                        | D., L. & N. R. R .....    | 781          |
| Williamston .....                          | D., L. & N. R. R .....    | 891          |
| Winthrop Mine .....                        | M., H & O. R. R .....     | 1,456        |
| Wood Lake .....                            | G. R. & Ind. R. R .....   | 891          |
| Wood's Corners .....                       | D., L. & N. R. R .....    | 851          |
| Wood's Mill .....                          | D., L. & N. R. R .....    | 926          |
| Woodstock, Geodetic Station .....          | U. S. Lake Survey .....   | 1,191        |
| Wyandotte .....                            | L. S. & M. S. R. R .....  | 580          |
| Wyman .....                                | D., L. & N. R. R .....    | 960          |
| Ypsilanti .....                            | Mich. Cent. R. R .....    | 714          |

| Station.                              | Authority.               | Elevation.   |
|---------------------------------------|--------------------------|--------------|
|                                       |                          | <i>Feet.</i> |
| Scio.....                             | Mich. Cent. R. R.....    | 845          |
| Shafatsburg.....                      | C. & G. T. R. R.....     | 879          |
| Shelby Depot.....                     | C. & M. L. S. R. R.....  | 808          |
| Shelbyville.....                      | G. R. & Ind. R. R.....   | 832          |
| Shelter Bay, Geodetic Station.....    | U. S. Lake Survey.....   | 1,054        |
| Shenango Mine.....                    | M. H. & O. R. R.....     | 1,421        |
| Shepardsville.....                    | D., G. H. & M. R. R..... | 749          |
| Sheridan.....                         | D., L. & N. R. R.....    | 856          |
| Do.....                               | G. R. V. R. R.....       | 806          |
| Sherman, Geodetic Station.....        | U. S. Lake Survey.....   | 1,038        |
| Sherwood.....                         | Mich. A. L. R. R.....    | 872          |
| Shiloh.....                           | D., L. & N. R. R.....    | 848          |
| Simons.....                           | G. R. & Ind. R. R.....   | 1,219        |
| Snyder.....                           | Mich. A. L. R. R.....    | 971          |
| South Boardman.....                   | G. R. & Ind. R. R.....   | 1,005        |
| South Haven.....                      | K. & S. H. R. R.....     | 583          |
| South Lansing.....                    | L. S. & M. S. R. R.....  | 807          |
| South Lyon.....                       | D., L. N. R. R.....      | 933          |
| Spinnings.....                        | D. & B. C. R. R.....     | 621          |
| Spring Arbor.....                     | Mich. A. L. R. R.....    | 994          |
| Spring Lake.....                      | D., G. H. & M. R. R..... | 596          |
| Springport.....                       | L. S. & M. S. R. R.....  | 986          |
| Spurr Mine.....                       | M. H. & O. R. R.....     | 1,607        |
| Spurr Mountain.....                   | M. H. & O. R. R.....     | 1,602        |
| Standard Mine.....                    | M. H. & O. R. R.....     | 1,538        |
| Standish.....                         | J., L. & S. R. R.....    | 627          |
| Stanton.....                          | D., L. & N. R. R.....    | 904          |
| Stanton Junction.....                 | D., L. & N. R. R.....    | 821          |
| Stanwood.....                         | G. R. & Ind. R. R.....   | 954          |
| State Road.....                       | J., L. & S. R. R.....    | 602          |
| Stimpson's.....                       | A. & D. R. R.....        | 865          |
| Sterling.....                         | M. H. & O. R. R.....     | 1,567        |
| Steward Mine.....                     | M. H. & O. R. R.....     | 1,602        |
| Sturgeon.....                         | M. H. & O. R. R.....     | 1,643        |
| Sturgeon River, Geodetic Station..... | U. S. Lake Survey.....   | 947          |
| Sturgis.....                          | L. S. & M. S. R. R.....  | 934          |
| Suffield.....                         | C. & G. T. R. R.....     | 783          |
| Superior, Lake.....                   | U. S. Lake Survey.....   | 602          |
| Swartz Creek.....                     | C. & G. T. R. R.....     | 782          |
| Taylor.....                           | M., H. & O. R. R.....    | 1,225        |
| Taylor Mine.....                      | M., H. & O. R. R.....    | 1,516        |
| Tecumseh.....                         | L. S. & M. S. R. R.....  | 807          |
| Tekonsha.....                         | Mich. A. L. R. R.....    | 937          |
| Terry's.....                          | J., L. & S. R. R.....    | 589          |
| Thomas.....                           | D. & B. C. R. R.....     | 1,093        |
| Three Lakes.....                      | M., H. & O. R. R.....    | 1,616        |
| Three Oaks.....                       | Mich. Cent. R. R.....    | 669          |
| Three Rivers.....                     | L. S. & M. S. R. R.....  | 805          |
| Travis.....                           | G. R. & Ind. R. R.....   | 742          |
| Trenton.....                          | L. S. & M. S. R. R.....  | 584          |
| Tribola, Geodetic Station.....        | U. S. Lake Survey.....   | 1,237        |
| Trowbridge.....                       | C. & G. T. R. R.....     | 851          |
| Trufant's.....                        | D., L. & N. R. R.....    | 884          |
| Tustin.....                           | G. R. & Ind. R. R.....   | 1,212        |
| Union City.....                       | Mich. A. L. R. R.....    | 900          |
| Upper Big Rapids.....                 | G. R. & Ind. R. R.....   | 927          |
| Utica.....                            | D. & B. C. R. R.....     | 650          |
| Vandalia.....                         | Mich. A. L. R. R.....    | 878          |
| Vassar.....                           | D. & B. C. R. R.....     | 643          |
| Vermontville.....                     | G. R. V. R. R.....       | 817          |
| Vernon.....                           | D., G. H. & M. R. R..... | 770          |
| Vicksburg.....                        | G. R. & Ind. R. R.....   | 852          |
| Vulcan, Geodetic Station.....         | U. S. Lake Survey.....   | 1,328        |
| Wagar's.....                          | D., L. & N. R. R.....    | 856          |

| Station.                              | Authority.                 | Elevation.   |
|---------------------------------------|----------------------------|--------------|
|                                       |                            | <i>Fret.</i> |
| Butterfield.....                      | St., P. & S. C. R. R.....  | 1,184        |
| Byron.....                            | C. & N. W. R. R.....       | 1,250        |
| Campbell.....                         | St. P. & P. R. R.....      | 977          |
| Canby.....                            | C. & N. W. R. R.....       | 1,243        |
| Carver.....                           | C., M. & St. P. R. R.....  | 815          |
| Do.....                               | M. & St. L. R. R.....      | 719          |
| Cass Lake, water.....                 | U. S. Engineer Corps.....  | 1,300        |
| Castle Rock.....                      | C. M. & St. P. R. R.....   | 935          |
| Centreville.....                      | L., S. & M. R. R. R.....   | 929          |
| Chaska.....                           | C., M. & St. P. R. R.....  | 728          |
| Do, crossing of M. & St. L. R. R..... | C., M. & St. P. R. R.....  | 730          |
| Chatfield.....                        | C. & N. W. R. R.....       | 976          |
| Chatfield Junction.....               | C. & N. W. R. R.....       | 1,275        |
| Chester.....                          | C. & N. W. R. R.....       | 1,122        |
| Christina.....                        | St. P. & P. R. R.....      | 1,219        |
| Claremont.....                        | C. & N. W. R. R.....       | 1,280        |
| Clear Lake.....                       | St. P. & P. R. R.....      | 993          |
| Clear Water, water.....               | U. S. Engineer Corps.....  | 936          |
| Clinton Falls.....                    | C., M. & St. P. R. R.....  | 1,107        |
| Cockato.....                          | St. P. & P. R. R.....      | 1,022        |
| Courtland.....                        | C. & N. W. R. R.....       | 936          |
| Do... bridge.....                     | C. & N. W. R. R.....       | 811          |
| Do... high water.....                 | C. & N. W. R. R.....       | 797          |
| Crookston.....                        |                            | 881          |
| Crow Wing.....                        | St. P. & P. R. R.....      | 1,190        |
| Do.... water.....                     | U. S. Engineer Corps.....  | 1,146        |
| Crystal, Lake.....                    | St. P. & S. C. R. R.....   | 994          |
| Dahlgren.....                         | C., M. & St. P. R. R.....  | 962          |
| Darwin.....                           | St. P. & P. R. R.....      | 1,127        |
| Davis, Camp.....                      | Pacific R. R. Reports..... | 994          |
| Dayton Bluff.....                     | C., M. & St. P. R. R.....  | 710          |
| De Forest.....                        | C., M. & St. P. R. R.....  | 1,446        |
| De Graff.....                         | St. P. & P. R. R.....      | 1,056        |
| Delano.....                           | St. P. & P. R. R.....      | 923          |
| Delevan.....                          | C., M. & St. P. R. R.....  | 1,057        |
| Detroit City.....                     | N. P. R. R.....            | 1,364        |
| Dexter.....                           | C., M. & St. P. R. R.....  | 1,412        |
| Dodge Centre.....                     | C. & N. W. R. R.....       | 1,288        |
| Doran.....                            | St. P. & P. R. R.....      | 968          |
| Doty.....                             | C. & N. W. R. R.....       | 1,310        |
| Douglas.....                          | St., & P. R. R.....        | 1,121        |
| Dover.....                            | C. & N. W. R. R.....       | 1,134        |
| Drake.....                            | St. P. & S. C. R. R.....   | 1,516        |
| Dresbach.....                         | C. M. & St. P. R. R.....   | 676          |
| Duluth.....                           | N. P. R. R.....            | 607          |
| Do... Lake Superior.....              | N. P. R. R.....            | 602          |
| Do... Signal Station.....             | U. S. Signal Office.....   | 644          |
| Dundas.....                           | C., M. & St. P. R. R.....  | 955          |
| Dundee.....                           | St. P. & S. C. R. R.....   | 1,443        |
| Eagle Creek bridge.....               | St. P. & S. C. R. R.....   | 708          |
| Eagle Lake.....                       | C. & N. W. R. R.....       | 1,012        |
| East Henderson, water.....            | U. S. Engineer Corps.....  | 710          |
| East Henderson.....                   | St. P. & S. C. R. R.....   | 734          |
| East Minneapolis.....                 | M. & St. L. R. R.....      | 830          |
| East Okabena Lake, water.....         | St. P. & S. C. R. R.....   | 1,569        |
| Easton.....                           | C., M. & St. P. R. R.....  | 1,046        |
| East Richmond.....                    | C., M. & St. P. R. R.....  | 658          |
| East Saint Cloud.....                 | St. P. & P. R. R.....      | 1,011        |
| East Saint Peter.....                 | St. P. & S. C. R. R.....   | 748          |
| East Sawteeth, Geodetic Station.....  | U. S. Lake Survey.....     | 1,505        |
| Eckelson, Lake.....                   | R. R. Reports.....         | 1,454        |
| Eden Prairie.....                     | M. & St. L. R. R.....      | 882          |
| Edgerton.....                         | C., M. & St. P. R. R.....  | 1,550        |
| Elgin.....                            | C. & N. W. R. R.....       | 1,069        |

| Station.                                              | Authority.                 | Elevation.   |
|-------------------------------------------------------|----------------------------|--------------|
|                                                       |                            | <i>Feet.</i> |
| Elk Lake .....                                        | P. R. R. Reports .....     | 1,296        |
| Elk River .....                                       | St. P. & P. R. R. ....     | 903          |
| Elk River, water .....                                | U. S. Engineer Corps ..... | 850          |
| Ellea .....                                           | Toner .....                | 1,600        |
| Empire .....                                          | C., M. & St. P. R. R. .... | 889          |
| Evansville .....                                      | St. P. & P. R. R. ....     | 1,345        |
| Eyota .....                                           | C. & N. W. R. R. ....      | 1,237        |
| Fairfield .....                                       | C., M. & St. P. R. R. .... | 943          |
| Fairmount .....                                       | C., M. & St. P. R. R. .... | 1,176        |
| Faribault .....                                       | C., M. & St. P. R. R. .... | 1,002        |
| Farmington, crossing H. & D. R. R. ....               | C., M. & St. P. R. R. .... | 901          |
| Do..... Depot .....                                   | C., M. & St. P. R. R. .... | 904          |
| Do..... crossing Iowa and Minnesota<br>division ..... | C., M. & St. P. R. R. .... | 904          |
| Faxon, water .....                                    | U. S. Engineer Corps ..... | 699          |
| Flandreau, Big Sioux River .....                      | St. P. & S. C. R. R. ....  | 1,501        |
| Fond du Lac .....                                     | N. P. R. R. ....           | 608          |
| Forest Lake .....                                     | L. S. & M. R. R. R. ....   | 906          |
| Forest Mills .....                                    | C. & N. W. R. R. ....      | 1,023        |
| Do..... .....                                         | Minn. Mid. R. R. ....      | 970          |
| Fountain .....                                        | C., M. & St. P. R. R. .... | 1,302        |
| Frazee City .....                                     | N. P. R. R. ....           | 1,411        |
| Frontenac .....                                       | C., M. & St. P. R. R. .... | 721          |
| Fulda .....                                           | C., M. & St. P. R. R. .... | 1,508        |
| Fulton .....                                          | St. P. & P. R. R. ....     | 709          |
| Furk .....                                            | Minn. Mid. R. R. ....      | 821          |
| Glasgow .....                                         | Minn. Mid. R. R. ....      | 717          |
| Glencoe .....                                         | C., M. & St. P. R. R. .... | 1,007        |
| Glenville .....                                       | B. C. R. & R. R. R. ....   | 1,223        |
| Glyndon .....                                         | N. P. R. R. ....           | 925          |
| Good Thunder .....                                    | C., M. & St. P. R. R. .... | 974          |
| Goose Lake .....                                      | L., S. & M. R. R. R. ....  | 888          |
| Gordon .....                                          | St. P. & P. R. R. ....     | 1,017        |
| Grand Meadow .....                                    | C., M. & St. P. R. R. .... | 1,338        |
| Grandview .....                                       | C. & N. W. R. R. ....      | 1,173        |
| Granite Falls .....                                   | C., M. & St. P. R. R. .... | 941          |
| Hamilton .....                                        | St. P. & S. C. R. R. ....  | 714          |
| Hammond .....                                         | Minn. Mid. R. R. ....      | 805          |
| Hancock .....                                         | St. P. & P. R. R. ....     | 1,150        |
| Hartland .....                                        | M. & St. L. R. R. ....     | 1,240        |
| Hastings .....                                        | C., M. & St. P. R. R. .... | 709          |
| Do... L. W. ....                                      | U. S. Engineer Corps ..... | 664          |
| Do... Junction .....                                  | C., M. & St. P. R. R. .... | 709          |
| Hatfield .....                                        | C., M. & St. P. R. R. .... | 1,662        |
| Havana .....                                          | C., M. & St. P. R. R. .... | 1,222        |
| Hawley .....                                          | N. P. R. R. ....           | 1,152        |
| Hayward .....                                         | C., M. & St. P. R. R. .... | 1,248        |
| Hector .....                                          | C., M. & St. P. R. R. .... | 1,081        |
| Helena .....                                          | M. & St. L. R. R. ....     | 886          |
| Henderson, water .....                                | U. S. Engineer Corps ..... | 709          |
| Henry Lake .....                                      | P. R. R. Reports .....     | 1,284        |
| Herman .....                                          | St. P. & P. R. R. ....     | 1,063        |
| Heron Lake, depot .....                               | St. P. & S. C. R. R. ....  | 1,417        |
| Do..... water .....                                   | St. P. & S. C. R. R. ....  | 1,403        |
| Hersey (Brewster) .....                               | St. P. & S. C. R. R. ....  | 1,485        |
| Hinckley .....                                        | L., S. & M. R. R. R. ....  | 1,025        |
| Hobart .....                                          | N. P. R. R. ....           | 1,386        |
| Hokah .....                                           | C., M. & St. P. R. R. .... | 649          |
| Homer .....                                           | C., M. & St. P. R. R. .... | 663          |
| Hopkins .....                                         | M. & St. L. R. R. ....     | 919          |
| Hospers .....                                         | Toner .....                | 1,438        |
| Houston .....                                         | C., M. & St. P. R. R. .... | 679          |
| Houtland .....                                        | M. & St. L. R. R. ....     | 1,247        |
| Hutchison .....                                       | Toner .....                | 1,050        |

| Station.                               | Authority.                    | Elevation.   |
|----------------------------------------|-------------------------------|--------------|
|                                        |                               | <i>Feet.</i> |
| Iceland .....                          | St. P. & S. C. R. R. ....     | 998          |
| Ida .....                              | St. P. & P. R. R. ....        | 1,402        |
| Iona .....                             | C., M. & St. P. R. R. ....    | 1,608        |
| Iosco .....                            | M. & St. L. R. R. ....        | 1,146        |
| Isanours .....                         | C., M. & St. P. R. R. ....    | 899          |
| Island Lake .....                      | N. P. R. R. ....              | 1,307        |
| Itasca .....                           | St. P. & P. R. R. ....        | 895          |
| Janesville .....                       | C. & N. W. R. R. ....         | 1,063        |
| Janett .....                           | Minn. Mid. R. R. ....         | 792          |
| Jessie Lake .....                      | P. R. R. Reports .....        | 1,260        |
| Jordan .....                           | M. & St. L. R. R. ....        | 753          |
| Judson, water .....                    | U. S. Engineer Corps .....    | 759          |
| Junction .....                         | St. P. & S. C. R. R. ....     | 1,633        |
| Kalikomeja Lake .....                  |                               | 1,092        |
| Kandiyoohi .....                       | St. P. & P. R. R. ....        | 1,216        |
| Kasota .....                           | C. & N. W. R. R. ....         | 794          |
| Do Junction .....                      | St. P. & S. C. R. R. ....     | 800          |
| Do Minnesota River Bridge .....        | C. & N. W. R. R. ....         | 781          |
| Do Minnesota River, low water .....    | C. & N. W. R. R. ....         | 723          |
| Do Minnesota River, high water .....   | C. & N. W. R. R. ....         | 735          |
| Kasson .....                           | C. & N. W. R. R. ....         | 1,252        |
| Keegan .....                           | Minn. Mid. R. R. ....         | 759          |
| Keegan's Lake, grade .....             | C., M. & St. P. R. R. ....    | 948          |
| Kellogg .....                          | C., M. & St. P. R. R. ....    | 702          |
| Kettle River depot .....               | L. S. & M. R. R. R. ....      | 1,114        |
| Kilkenny .....                         | M. & St. L. R. R. ....        | 1,056        |
| Kimberley .....                        | N. P. R. R. ....              | 1,233        |
| Kirkhoven .....                        | St. P. & P. R. R. ....        | 1,104        |
| Kittson .....                          | St. P. & P. R. R. ....        | 886          |
| Lac qui Parle .....                    | U. S. Engineer Corps .....    | 940          |
| La Crescent .....                      | C., M. & St. P. R. R. ....    | 647          |
| Do high-water mark .....               | C., M. & St. P. R. R. ....    | 648          |
| Do lime-kiln .....                     | C., M. & St. P. R. R. ....    | 650          |
| Lake Benton .....                      | C. & N. W. R. R. ....         | 1,759        |
| Lake City .....                        | C., M. & St. P. R. R. ....    | 705          |
| Do water .....                         | U. S. Engineer Corps .....    | 658          |
| Lake Crystal .....                     | St. P. & S. C. R. R. ....     | 967          |
| Lakefield .....                        | C., M. & St. P. R. R. ....    | 1,463        |
| Lake Side .....                        | N. P. R. R. ....              | 1,335        |
| Lake Traverse, water .....             | M. & St. P. R. R. ....        | 970          |
| Lamberton .....                        | C. & N. W. R. R. ....         | 1,144        |
| La Moille .....                        | C., M. & St. P. R. R. ....    | 660          |
| Lanesboro .....                        | C., M. & St. P. R. R. ....    | 841          |
| Langdon .....                          | C., M. & St. P. R. R. ....    | 813          |
| Langola .....                          | St. P. & P. R. R. ....        | 1,063        |
| Lansing .....                          | St. P. & P. R. R. ....        | 1,224        |
| Lapham .....                           | Smithsonian .....             | 850          |
| Leech Lake .....                       | U. S. Engineer Corps .....    | 1,292        |
| Lena .....                             | C. & N. W. R. R. ....         | 1,073        |
| Lester Riv. Geodetic Station .....     | U. S. Lake Survey .....       | 1,157        |
| Le Sueur .....                         | St. P. & S. C. R. R. ....     | 753          |
| Do water .....                         | U. S. Engineer Corps .....    | 715          |
| Do high water in Minnesota River ..... | St. P. & S. C. R. R. ....     | 735          |
| Lewiston .....                         | C. & N. W. R. R. ....         | 1,211        |
| Lincoln .....                          | St. P. & S. C. R. R. ....     | 1,042        |
| Litchfield .....                       | St. P. & P. R. R. ....        | 1,125        |
| Little Falls .....                     | St. P. & P. R. R. ....        | 1,118        |
| Long Lake Station .....                | St. P. & P. R. R. ....        | 949          |
| Lower Bass Lake .....                  | St. P., S. & T. F. R. R. .... | 893          |
| Luzerne .....                          | St. P. & S. C. R. R. ....     | 1,451        |
| Lyle .....                             | C., M. & St. P. R. R. ....    | 1,199        |
| McCracken .....                        | Minn. Mid. R. R. ....         | 739          |
| Madison .....                          | C., M. & St. P. R. R. ....    | 1,950        |
| Manchester .....                       | M. & St. L. R. R. ....        | 1,250        |

| Station.                                   | Authority.                   | Elevation.   |
|--------------------------------------------|------------------------------|--------------|
|                                            |                              | <i>Feet.</i> |
| Mankato.....                               | C., M. & St. P. R. R.....    | 770          |
| Do...water.....                            | U. S. Engineer Corps.....    | 751          |
| Manomin.....                               | St. P. & P. R. R.....        | 842          |
| Mapleton.....                              | C., M. & St. P. R. R.....    | 1,031        |
| Marion.....                                | Toner.....                   | 1,200        |
| Marshall.....                              | C. & N. W. R. R.....         | 1,174        |
| Mazeppa.....                               | Minn. Mid. R. R.....         | 935          |
| Medalia.....                               | St. P. & S. C. R. R.....     | 1,021        |
| Medford.....                               | C., M. & P. R. R.....        | 1,098        |
| Melrose.....                               | St. P. & P. R. R.....        | 1,189        |
| Mendota.....                               | St. P. & S. C. R. R.....     | 718          |
| Do...St. Paul Junction.....                | C., M. & St. P. R. R.....    | 759          |
| Meriden.....                               | C. & N. W. R. R.....         | 1,149        |
| Merriam Junction, St. P. & S. C. R. R..... | M. & St. L. R. R.....        | 753          |
| Midland Junction.....                      | Minn. Mid. R. R.....         | 695          |
| Milan.....                                 | C., M. & St. P. R. R.....    | 995          |
| Millville.....                             | Minn. Mid. R. R.....         | 787          |
| Minneapolis.....                           | M. & St. L. R. R.....        | 835          |
| Do.....Miss. Riv.....                      | U. S. Engineer Corps.....    | 794          |
| Minneiska L. W.....                        | U. S. Engineer Corps.....    | 644          |
| Minneopa.....                              | St. P. & S. C. R. R.....     | 871          |
| Do...bridge, 68 feet above water.....      | St. P. & S. C. R. R.....     | 863          |
| Minneota.....                              | C. & N. W. R. R.....         | 1,179        |
| Minnesota City.....                        | C., M. & St. P. R. R.....    | 677          |
| Minnesota Falls.....                       | C., M. & St. P. R. R.....    | 1,041        |
| Do.....(foot of).....                      | U. S. Engineer Corps.....    | 869          |
| Minnesota Lake.....                        | Do.....                      | 1,038        |
| Minnetonka Lake.....                       | St. P. & P. R. R.....        | 922          |
| Money Creek.....                           | C., M. & St. P. R. R.....    | 692          |
| Montgomery.....                            | M. & St. L. R. R.....        | 1,063        |
| Monticello, water.....                     | U. S. Engineer Corps.....    | 890          |
| Montevideo.....                            | C., M. & St. P. R. R.....    | 927          |
| Moorhead, Signal Station.....              | U. S. Signal Office.....     | 923          |
| Do...East bank Red River.....              | N. P. R. R.....              | 906          |
| Moose Lake, depot.....                     | L., S. & M. R. R. R.....     | 1,054        |
| Morris.....                                | St. P. & P. R. R.....        | 1,122        |
| Motley.....                                | N. P. R. R.....              | 1,222        |
| Mound Prairie.....                         | C., M. & St. P. R. R.....    | 660          |
| Mountain Lake.....                         | St. P. & S. C. R. R.....     | 1,300        |
| Mulford's Siding.....                      | M. & St. L. R. R.....        | 1,060        |
| Muskoda.....                               | N. P. R. R.....              | 1,085        |
| Newport.....                               | C., M. & St. P. R. R.....    | 751          |
| Do...L. W.....                             | U. S. Engineer Corps.....    | 672          |
| New Prague.....                            | M. & St. L. R. R.....        | 973          |
| New Richland.....                          | M. & St. L. R. R.....        | 1,178        |
| New Ulm.....                               | C. & N. W. R. R.....         | 837          |
| Do...high water in Minnesota River.....    | C. & N. W. R. R.....         | 808          |
| Nicollet.....                              | C. & N. W. R. R.....         | 980          |
| Nicols.....                                | St. P. & S. C. R. R.....     | 706          |
| Nininger, water.....                       | U. S. Engineer Corps.....    | 665          |
| Norman.....                                | N. P. R. R.....              | 1,287        |
| North Branch.....                          | L. S., M. R. R. R.....       | 885          |
| Northfield.....                            | C., M. & St. P. R. R.....    | 915          |
| Oakdale.....                               | St. P., S. & T. F. R. R..... | 879          |
| Oakes.....                                 | St. P. & P. R. R.....        | 1,228        |
| Oak Lake.....                              | N. P. R. R.....              | 1,369        |
| Oakland.....                               | C., M. & St. P. R. R.....    | 1,265        |
| Odeesa.....                                | C., M. & St. P. R. R.....    | 963          |
| Okabena.....                               | C., M. & St. P. R. R.....    | 1,410        |
| Olivia.....                                | C., M. & St. P. R. R.....    | 1,082        |
| Olmstead.....                              | C. & N. W. R. R.....         | 1,054        |
| Oronoco.....                               | C. & N. W. R. R.....         | 1,041        |
| Ortonville.....                            | C., M. & St. P. R. R.....    | 990          |

| Station.                                         | Authority.                 | Eleva |
|--------------------------------------------------|----------------------------|-------|
| Osakis.....                                      | St. P. & P. R. R.....      |       |
| Oshawa.....                                      | C. & N. W. R. R.....       |       |
| Ottawa.....                                      | St. P. & S. C. R. R.....   |       |
| Do... water.....                                 | U. S. Engineer Corps.....  |       |
| Owatonna.....                                    | C. & N. W. R. R.....       |       |
| Do... crossing, C. & N. W. R. R.....             | C., M. & St. P. R. R.....  |       |
| Pembina.....                                     | Toner.....                 |       |
| Pemidgi Lake.....                                | Toner.....                 |       |
| Perham.....                                      | N. P. R. R.....            |       |
| Peterson.....                                    | C., M. & St. P. R. R.....  |       |
| Pierre, Fort.....                                | Pacific R. R. Reports..... |       |
| Pike Lake.....                                   | Pacific R. R. Reports..... |       |
| Pillager.....                                    | N. P. R. R.....            |       |
| Pine City.....                                   | L., S. & M. R. R. R.....   |       |
| Pine Island.....                                 | C. & N. W. R. R.....       |       |
| Pipestone City.....                              | St. P. & S. C. R. R.....   |       |
| Do.....                                          | C., M. & St. P. R. R.....  |       |
| Plainview.....                                   | C. & N. W. R. R.....       |       |
| Do... Junction.....                              | C. & N. W. R. R.....       |       |
| Pomme de Terre.....                              | St. P. & P. R. R.....      |       |
| Do..... Creek (mouth).....                       | U. S. Engineer Corps.....  |       |
| Poplar Lake.....                                 | P. R. R. Reports.....      |       |
| Posts.....                                       | C. & N. W. R. R.....       |       |
| Prior Lake, Station.....                         | C., M. & St. P. R. R.....  |       |
| Do... water.....                                 | C., M. & St. P. R. R.....  |       |
| Qui Parle, Lake.....                             | Petermann.....             |       |
| Rainy Lake.....                                  | Hind.....                  |       |
| Ramsey, cross. S. Minn. R. R. & St. P. R. R..... | C., M. & St. P. R. R.....  |       |
| Randall.....                                     | St. P. & P. R. R.....      |       |
| Rapidan.....                                     | C., M. & St. P. R. R.....  |       |
| Read's Landing.....                              | C., M. & St. P. R. R.....  |       |
| Do..... L. W.....                                | U. S. Engineer Corps.....  |       |
| Red Wing.....                                    | C., M. & St. P. R. R.....  |       |
| Do... L. W.....                                  | U. S. Engineer Corps.....  |       |
| Redwood Falls.....                               | C. & N. W. R. R.....       |       |
| Reinville Trading Post.....                      |                            |       |
| Renville.....                                    | C., M. & St. P. R. R.....  |       |
| Richmond.....                                    | C., M. & St. P. R. R.....  |       |
| Ridgeley, Fort, water.....                       | U. S. Engineer Corps.....  |       |
| Ripley, Fort.....                                | St. P. & P. R. R.....      |       |
| Rochester.....                                   | C. & N. W. R. R.....       |       |
| Rolette.....                                     | St. P. & P. R. R.....      |       |
| Rosemount.....                                   | C., M. & St. P. R. R.....  |       |
| Rush City.....                                   | L., S. & M. R. R. R.....   |       |
| Rushford.....                                    | C., M. & St. P. R. R.....  |       |
| Rushmore.....                                    | St. P. & S. C. R. R.....   |       |
| Sacred Heart.....                                | C., M. & St. P. R. R.....  |       |
| St. Anthony's Falls.....                         | Smithsonian Inst.....      |       |
| Do... Junction.....                              | St. P. & P. R. R.....      |       |
| Do... low water, Mississippi River.....          | St. P. & P. R. R.....      |       |
| St. Augusta, water.....                          | U. S. Engineer Corps.....  |       |
| St. Charles.....                                 | C. & N. W. R. R.....       |       |
| St. Cloud, east shore Mississippi River.....     | St. P. & P. R. R.....      |       |
| Do... west shore Mississippi River.....          | St. P. & P. R. R.....      |       |
| Do... low water, Mississippi River.....          | St. P. & P. R. R.....      |       |
| St. Cloud Mill, Mississippi River.....           | U. S. Engineer Corps.....  |       |
| Do... low water, Mississippi River.....          | St. P. & P. R. R.....      |       |
| St. Croix Lake, draw-bridge.....                 | C. & N. W. R. R.....       |       |
| Do... low water.....                             |                            |       |
| St. James.....                                   | St. P. & S. C. R. R.....   |       |
| St. Johns.....                                   | St. P. & P. R. R.....      |       |
| St. Joseph.....                                  | St. P. & P. R. R.....      |       |
| St. Olof.....                                    | St. P. & P. R. R.....      |       |

| Station.                                                | Authority.                      | Elevation.   |
|---------------------------------------------------------|---------------------------------|--------------|
|                                                         |                                 | <i>Feet.</i> |
| St. Paul, extreme low water in Mississippi River, 1864. | U. S. Engineer Corps .....      | 683          |
| Do.. ordinary low water .....                           | Mean result from R. R. levels.. | 685          |
| Do.. high water, 1850 .....                             | U. S. Engineer Corps .....      | 702          |
| Do.. Union Depot (old level) .....                      | Mean result from R. R. levels.. | 688          |
| Do.. Union Depot (new level) .....                      | Mean result from R. R. levels.. | 702          |
| Do.. Signal Station .....                               | U. S. Signal Office .....       | 811          |
| St. Peter .....                                         | C. & N. W. R. R. .....          | 812          |
| Do.. water .....                                        | U. S. Engineer Corps .....      | 729          |
| St. Vincent, bank Red River .....                       | St. P. & P. R. R. .....         | 792          |
| Do.. high water, 1866 .....                             | St. P. & P. R. R. .....         | 787          |
| Do.. usual water surface .....                          | St. P. & P. R. R. .....         | 758          |
| Do.. Signal Station .....                               | U. S. Signal Office .....       | 804          |
| Sakatah Lake .....                                      | Toner .....                     | 932          |
| Sandy .....                                             | C. & N. W. R. R. .....          | 1,089        |
| Do.. Lake .....                                         | Toner .....                     | 1,450        |
| Sauk Center .....                                       | St. P. & P. R. R. .....         | 1,232        |
| Sauk Rapids .....                                       | St. P. & P. R. R. .....         | 1,008        |
| Shakopee, crossing of St. P. & S. C. R. R. ..           | C., M. & St. P. R. R. .....     | 756          |
| Do.. low water, Minnesota River ..                      | C., M. & St. P. R. R. .....     | 692          |
| Do.. high water, Minnesota River ..                     | C., M. & St. P. R. R. .....     | 719          |
| Sherburne .....                                         | C., M. & St. P. R. R. .....     | 1,273        |
| Shetek Lake .....                                       | Petermann .....                 | 1,518        |
| Siocottes .....                                         | N. P. R. R. .....               | 1,282        |
| Sleepy Eye .....                                        | C. & N. W. R. R. .....          | 1,034        |
| Do.. Lake Station .....                                 | C. & N. W. R. R. .....          | 1,020        |
| Smith Lake .....                                        | S., P. & P. R. R. .....         | 1,049        |
| Snelling, Fort .....                                    | Med. Dep., U. S. A. .....       | 820          |
| South Bend .....                                        | St. P. & S. C. R. R. .....      | 808          |
| Do.. water .....                                        | U. S. Engineer Corps .....      | 755          |
| Spirit Lake .....                                       | Toner .....                     | 1,310        |
| Split Rock, Geodetic Station .....                      | U. S. Lake Survey .....         | 765          |
| Springfield .....                                       | C. & N. W. R. R. .....          | 1,025        |
| Spring Valley .....                                     | C., M. & St. P. R. R. .....     | 1,266        |
| Stanley .....                                           | St. P. & P. R. R. .....         | 902          |
| Stewart .....                                           | C., M. & St. P. R. R. .....     | 1,064        |
| Stillwater .....                                        | St. P., S. & T. F. R. R. .....  | 680          |
| Do.. low water in Saint Croix Lake ..                   | St. P., S. & T. F. R. R. .....  | 660          |
| Stillwater Junction .....                               | C. & N. W. R. R. .....          | 876          |
| Stockton .....                                          | C. & N. W. R. R. .....          | 753          |
| Sueur Lake .....                                        | Petermann .....                 | 1,011        |
| Sumter .....                                            | C., M. & St. P. R. R. .....     | 1,035        |
| Superior, Lake .....                                    | U. S. Engineer Corps .....      | 602          |
| Swede Grove .....                                       | St. P. & P. R. R. .....         | 1,186        |
| Takara Lake .....                                       |                                 | 1,168        |
| Theilman .....                                          | Minn. Mid. R. R. .....          | 743          |
| Thompson .....                                          | N. P. R. R. .....               | 1,038        |
| Tiger Lake .....                                        | R. R. reports .....             | 979          |
| Do.. water .....                                        | C., M. & St. P. R. R. .....     | 979          |
| Tintah .....                                            | St. P. & P. R. R. .....         | 991          |
| Tracey .....                                            | C. & N. W. R. R. .....          | 1,403        |
| Do .....                                                | Minn. Mid. R. R. .....          | 756          |
| Traverse Lake, water .....                              | U. S. Engineer Corps .....      | 950          |
| Tumuli .....                                            | St. P. & P. R. R. .....         | 1,196        |
| Twin Lakes .....                                        | M. & St. L. R. R. .....         | 1,255        |
| Twin Rivers, water .....                                | St. P. & P. R. R. .....         | 1,117        |
| Tyler .....                                             | C. & N. W. R. R. .....          | 1,750        |
| Upper Bass Lake .....                                   | St. P., S. & T. F. R. R. .....  | 926          |
| Utica .....                                             | C. & N. W. R. R. .....          | 1,170        |
| Victoria .....                                          | St. P. & P. R. R. .....         | 1,366        |
| Viola .....                                             | C. & N. W. R. R. .....          | 1,129        |
| Wabasha .....                                           | C., M. & St. P. R. R. .....     | 712          |
| Do.. water .....                                        | U. S. Engineer Corps .....      | 656          |



| Station.                              | Authority.                    | Elevation.   |
|---------------------------------------|-------------------------------|--------------|
|                                       |                               | <i>Feet.</i> |
| Wacouta, low water .....              | U. S. Engineer Corps .....    | 659          |
| Wadena .....                          | N. P. R. R. ....              | 1,351        |
| Walnut Grove .....                    | C. & N. W. R. R. ....         | 1,223        |
| Waseca .....                          | C. & N. W. R. R. ....         | 1,153        |
| Watab .....                           | St. P. & P. R. R. ....        | 1,057        |
| Do. Mississippi River .....           | U. S. Engineer Corps .....    | 1,001        |
| Waterville .....                      | M. & St. L. R. R. ....        | 1,008        |
| Watson .....                          | C., M. & St. P. R. R. ....    | 1,029        |
| Waverly .....                         | St. P. & P. R. R. ....        | 1,007        |
| Wayzata .....                         | St. P. & P. R. R. ....        | 931          |
| Weaver .....                          | C., M. & St. P. R. R. ....    | 674          |
| Wells .....                           | C., M. & St. P. R. R. ....    | 1,153        |
| Westcott .....                        | C., M. & St. P. R. R. ....    | 882          |
| West Saint Cloud .....                | St. P. & P. R. R. ....        | 1,025        |
| West Sawteeth, Geodetic Station ..... | U. S. Lake Survey .....       | 1,532        |
| West Union .....                      | St. P. & P. R. R. ....        | 1,323        |
| Whalan .....                          | C., M. & St. P. R. R. ....    | 786          |
| White Bear .....                      | M. & St. L. R. R. ....        | 919          |
| White Bear Lake Junction .....        | L. S. & M. R. R. R. ....      | 928          |
| White Earth .....                     | Toner .....                   | 1,670        |
| Wilder .....                          | St. P. & S. C. R. R. ....     | 1,448        |
| Wild Rice .....                       | St. P. & P. R. R. ....        | 903          |
| Willmar .....                         | St. P. & P. R. R. ....        | 1,124        |
| Windom .....                          | St. P. & S. C. R. R. ....     | 1,353        |
| Winnebago City .....                  | C., M. & St. P. R. R. ....    | 1,096        |
| Winnibigoshish Lake .....             | U. S. Engineer Corps .....    | 1,290        |
| Winona .....                          | C., M. & St. P. R. R. ....    | 662          |
| Do. low water .....                   | U. S. Engineer Corps .....    | 634          |
| Win's Station .....                   | St. P., S. & T. F. R. R. .... | 916          |
| Withington .....                      | N. P. R. R. ....              | 1,272        |
| Woods, Lake of the .....              | Hinds .....                   | 978          |
| Woodstock .....                       | St. P. & S. C. R. R. ....     | 1,822        |
| Worthington .....                     | St. P. & S. C. R. R. ....     | 1,582        |
| Wykoff .....                          | C., M. & St. P. R. R. ....    | 1,310        |
| Wyoming .....                         | L. S. & M. R. R. R. ....      | 869          |
| Young America .....                   | C., M. & St. P. R. R. ....    | 990          |
| Zumbro Falls .....                    | Minn. Mid. R. R. ....         | 836          |
| Zumbrota .....                        | Minn. Mid. R. R. ....         | 980          |

# MISSISSIPPI.

| Station.                            | Authority.                | Elevation.   |
|-------------------------------------|---------------------------|--------------|
|                                     |                           | <i>Feet.</i> |
| ns .....                            | M. & N. W. R. R. ....     | 86           |
| ia .....                            | M. & O. R. R. ....        | 244          |
| wyn .....                           | M. & O. R. R. ....        | 379          |
| ett .....                           | N. O. & N. E. R. R. ....  | 306          |
| Saint Louis .....                   | N. O., M. & T. R. R. .... | 24           |
| eville .....                        | M. & O. R. R. ....        | 511          |
| Do... Summit .....                  | M. & O. R. R. ....        | 513          |
| ksville .....                       | M. & O. R. R. ....        | 275          |
| atunna .....                        | M. & O. R. R. ....        | 150          |
| sville .....                        | Memphis & C. R. R. ....   | 463          |
| rsdale .....                        | M. & N. W. R. R. ....     | 87           |
| ine .....                           | N. O. & N. E. R. R. ....  | 276          |
| ith .....                           | Memphis & C. R. R. ....   | 434          |
| ford .....                          | M. & O. R. R. ....        | 316          |
| y .....                             | N. O. & N. E. R. R. ....  | 168          |
| oto .....                           | M. & O. R. R. ....        | 210          |
| abutchie .....                      | N. O. & N. E. R. R. ....  | 169          |
| Pearl River .....                   | N. O. & N. E. R. R. ....  | 48           |
| it .....                            | M. & O. R. R. ....        | 306          |
| ville .....                         | N. O. & N. E. R. R. ....  | 239          |
| rprise .....                        | M. & O. R. R. ....        | 248          |
| ta .....                            | N. O. & N. E. R. R. ....  | 260          |
| dale .....                          | Memphis & C. R. R. ....   | 495          |
| Do .....                            | M. & N. W. R. R. ....     | 936          |
| nwood, on Yazoo River .....         | V. & N. R. R. ....        | 154          |
| Do... high water, Yazoo River ..... | V. & N. R. R. ....        | 158          |
| ada, Miss. Cent. R. R. ....         | V. & N. R. R. ....        | 213          |
| town .....                          | M. & O. R. R. ....        | 396          |
| tiesburg .....                      | N. O. & N. E. R. R. ....  | 144          |
| elberg .....                        | N. O. & N. E. R. R. ....  | 315          |
| bland .....                         | N. O. & N. E. R. R. ....  | 174          |
| .....                               | Memphis & C. R. R. ....   | 455          |
| etown .....                         | M. & N. W. R. R. ....     | 86           |
| ners .....                          | N. O. & N. E. R. R. ....  | 235          |
| derdale .....                       | M. & O. R. R. ....        | 213          |
| rel .....                           | N. O. & N. E. R. R. ....  | 239          |
| khart .....                         | M. & O. R. R. ....        | 360          |
| Do... Summit .....                  | .....                     | 426          |
| n .....                             | M. & N. W. R. R. ....     | 87           |
| on .....                            | M. & O. R. R. ....        | 185          |
| gnolia .....                        | M. & N. W. R. R. ....     | 93           |
| /hew .....                          | M. & O. R. R. ....        | 213          |
| idian .....                         | M. & O. R. R. ....        | 336          |
| issippi City .....                  | N. O., M. & T. R. R. .... | 10           |
| chell's .....                       | N. O. & N. E. R. R. ....  | 69           |
| ldon .....                          | M. & O. R. R. ....        | 304          |
| keeta .....                         | M. & O. R. R. ....        | 183          |
| an Springs .....                    | N. O., M. & T. R. R. .... | 28           |
| hols .....                          | N. O. & N. E. R. R. ....  | 219          |
| alona .....                         | M. & O. R. R. ....        | 311          |
| huta .....                          | N. O. & N. E. R. R. ....  | 282          |
| e Christian .....                   | N. O. M. & T. R. R. ....  | 10           |
| tana .....                          | N. O. & N. E. R. R. ....  | 271          |
| stotoc Ridge .....                  | V. & N. R. R. ....        | 516          |
| larville .....                      | N. O. & N. E. R. R. ....  | 313          |
| irie .....                          | M. & O. R. R. ....        | 311          |
| rvis .....                          | N. O. & N. E. R. R. ....  | 360          |
| itman .....                         | M. & O. R. R. ....        | 231          |

| Station.                           | Authority.               | Elevation.   |
|------------------------------------|--------------------------|--------------|
|                                    |                          | <i>Feet.</i> |
| Rienzi.....                        | M. & O. R. R.....        | 441          |
| Russells.....                      | Ala. G. S. R. R.....     | 412          |
| Saltillo.....                      | M. & O. R. R.....        | 318          |
| Scooba.....                        | M. & O. R. R.....        | 193          |
| Shannon.....                       | M. & O. R. R.....        | 249          |
| Shubuta.....                       | M. & O. R. R.....        | 197          |
| Shuqulak.....                      | M. & O. R. R.....        | 221          |
| Sucarnochee.....                   | M. & O. R. R.....        | 225          |
| Sulowah.....                       | N. O. & N. E. R. R.....  | 245          |
| Tibbee.....                        | M. & O. R. R.....        | 207          |
| Toomsaba.....                      | Ala. G. S. R. R.....     | 295          |
| Tupelo.....                        | M. & O. R. R.....        | 280          |
| Tuscanola.....                     | N. O. & N. E. R. R.....  | 223          |
| Verona.....                        | M. & O. R. R.....        | 307          |
| Vicksburg & Meridian Junction..... | N. O. & N. E. R. R.....  | 308          |
| Vicksburg, Signal Station.....     | U. S. Signal Office..... | 244          |
| Vossburg.....                      | N. O. & N. E. R. R.....  | 424          |
| Wahalak.....                       | M. & O. R. R.....        | 187          |
| Wantubbee.....                     | N. O. & N. E. R. R.....  | 349          |
| Waynesboro'.....                   | M. & O. R. R.....        | 191          |
| West Enterprise.....               | N. O. & N. E. R. R.....  | 256          |
| West Pascagoula.....               | N. O., M. & T. R. R..... | 8            |
| West Point.....                    | M. & O. R. R.....        | 243          |
| Winchester.....                    | M. & O. R. R.....        | 165          |
| Yazoo Pass.....                    | M. & N. W. R. R.....     | 95           |

# MISSOURI.

| Station.                                          | Authority.                       | Elevation.          |
|---------------------------------------------------|----------------------------------|---------------------|
| <b>Alexandria</b> , H. W. Mississippi River, 1851 | Mo., Iowa & Neb. R. R. ....      | <i>Feet.</i><br>487 |
| Do.....L. W. Mississippi River, 1872..            | Mo., Iowa & Neb. R. R. ....      | 465                 |
| <b>Allen</b> ville .....                          | St. L., I. Mt. & S. R. R. ....   | 353                 |
| <b>Alma</b> , L. W. ....                          | U. S. Eng'r. Corps.....          | 651                 |
| <b>Amazonia</b> .....                             | K. C., St. J. & C. B. R. R. .... | 833                 |
| <b>Annapolis</b> .....                            | St. L., I. Mt. & S. R. R. ....   | 635                 |
| <b>Appleton</b> .....                             | Mo., Kans. & Tex. R. R. ....     | 868                 |
| <b>Arbela</b> .....                               | Mo., Iowa & Neb. R. R. ....      | 655                 |
| <b>Arlington</b> .....                            | St. L. & S. F. R. R. ....        | 708                 |
| <b>Arnold</b> .....                               | H. & St. J. R. R. ....           | 739                 |
| <b>Ash Hills</b> .....                            | St. L., I. Mt. & S. R. R. ....   | 335                 |
| <b>Athens</b> .....                               | Toner .....                      | 492                 |
| <b>Atlanta</b> .....                              | W., St. L. & P. R. R. ....       | 906                 |
| <b>Augusta</b> .....                              | Smithsonian Inst .....           | 790                 |
| <b>Aurora</b> .....                               | St. L. & S. F. R. R. ....        | 1,357               |
| <b>Austin</b> .....                               | Mo., Kans. & Tex. R. R. ....     | 748                 |
| <b>Autumwa</b> , track station house .....        | W., St. L. & P. R. R. ....       | 647                 |
| <b>Bailey</b> .....                               | St. L., I. Mt. & S. R. R. ....   | 417                 |
| <b>Barkley</b> .....                              | H. & St. J. R. R. ....           | 637                 |
| <b>Barnard</b> .....                              | K. C., St. J. & C. B. R. R. .... | 943                 |
| <b>Barrel's Station</b> .....                     | Toner .....                      | 512                 |
| <b>Barrett's</b> .....                            | Toner .....                      | 506                 |
| <b>Beaman</b> .....                               | Mo., Kans. & Tex. R. R. ....     | 765                 |
| <b>Bear Creek</b> .....                           | H. & St. J. R. R. ....           | 589                 |
| <b>Belmont</b> .....                              | St. L., I. Mt. & S. R. R. ....   | 313                 |
| <b>Benton</b> .....                               | Toner .....                      | 470                 |
| <b>Berger</b> .....                               | Toner .....                      | 515                 |
| <b>Bertrand</b> .....                             | Toner .....                      | 317                 |
| <b>Bessville</b> .....                            | Toner .....                      | 531                 |
| <b>Beverly</b> .....                              | K. C., St. J. & C. B. R. R. .... | 769                 |
| Do. crossing C., R., I. & P. R. R. ....           | K. C., St. J. & C. B. R. R. .... | 769                 |
| <b>Bevier</b> .....                               | H. & St. J. R. R. ....           | 780                 |
| <b>Bigelow</b> .....                              | K. C., St. J. & C. B. R. R. .... | 861                 |
| <b>Big Field</b> .....                            | C., G. & S. L. R. R. ....        | 317                 |
| <b>Billings</b> .....                             | St. L. & S. F. R. R. ....        | 1,360               |
| <b>Birds Point</b> .....                          | St. L., I. Mt. & S. R. R. ....   | 321                 |
| <b>Bismarck</b> .....                             | St. L., I. Mt. & S. R. R. ....   | 1,024               |
| <b>Blackwell</b> .....                            | St. L., I. Mt. & S. R. R. ....   | 592                 |
| <b>Bolckow</b> .....                              | K. C., St. J. & C. B. R. R. .... | 930                 |
| <b>Bolivar</b> .....                              | Toner .....                      | 1,000               |
| <b>Bonnot's Mills</b> .....                       | Toner .....                      | 542                 |
| <b>Boone Creek</b> .....                          | Toner .....                      | 949                 |
| <b>Boonville</b> .....                            | Mo., Kans. & Tex. R. R. ....     | 607                 |
| <b>Bottsville</b> .....                           | Toner .....                      | 763                 |
| <b>Bourbon</b> .....                              | St. L. & S. F. R. R. ....        | 941                 |
| <b>Bowling Green</b> .....                        | L. & M. R. R. ....               | 881                 |
| <b>Boynton</b> .....                              | B. & S. R. R. ....               | 879                 |
| <b>Breckenridge</b> .....                         | H. & St. J. R. R. ....           | 926                 |
| <b>Brecklin</b> .....                             | H. & St. J. R. R. ....           | 516                 |
| <b>Brookfield</b> .....                           | H. & St. J. R. R. ....           | 757                 |
| <b>Brookline</b> .....                            | St. L. & S. F. R. R. ....        | 1,289               |
| <b>Brook's Mill</b> .....                         | L. R., V. & Ark. R. R. ....      | 285                 |
| <b>Browning</b> .....                             | B. & S. R. R. ....               | 760                 |
| <b>Brusawick</b> .....                            | W., St. L. & P. R. R. ....       | 644                 |
| <b>Brush Creek</b> .....                          | St. L. & S. F. R. R. ....        | 1,359               |
| <b>Buckland</b> .....                             | St. L. & S. F. R. R. ....        | 897                 |
| <b>Bucklin</b> .....                              | H. & St. J. R. R. ....           | 786                 |

| Station.                                      | Authority.                       | Elevation.   |
|-----------------------------------------------|----------------------------------|--------------|
|                                               |                                  | <i>Feet.</i> |
| Bunkerhill .....                              | St. L. & S. F. R. R. ....        | 1,434        |
| Burton .....                                  | Mo., Kans. & Tex. R. R. ....     | 672          |
| Bushberg .....                                | St. L., I. Mt. & S. R. R. ....   | 411          |
| Cadet .....                                   | Toner .....                      | 805          |
| Cahoka .....                                  | Mo., Iowa. & Neb. R. R. ....     | 697          |
| Cairo .....                                   | W., St. L. & P. R. R. ....       | 860          |
| Calhoun .....                                 | Mo., Kans. & Tex. R. R. ....     | 774          |
| California .....                              | Toner .....                      | 864          |
| Callao .....                                  | H. & St. J. R. R. ....           | 812          |
| Camden, Missouri River .....                  | W., St. L. & P. R. R. ....       | 724          |
| Cameron Junction .....                        | H. & St. J. R. R. ....           | 1,026        |
| Do.....crossing C., R. I. & P.<br>grade ..... | H. & St. J. R. R. ....           | 1,028        |
| Camp Branch .....                             | Mo., Kans. & Tex. R. R. ....     | 903          |
| Cane Ridge .....                              | L. R. V. & Ark. R. R. ....       | 288          |
| Caney Creek .....                             | St. L., I. Mt. & S. R. R. ....   | 338          |
| Cape Girardeau .....                          | C. G. & S. L. R. R. ....         | 338          |
| Carbon .....                                  | H. & St. J. R. R. ....           | 867          |
| Carbon Center .....                           | R. H. R. R. ....                 | 772          |
| Carrollton .....                              | W., St. L. & P. R. R. ....       | 667          |
| Carthage .....                                | St. L. & S. F. R. R. ....        | 1,269        |
| Cassville .....                               | Smithsonian Inst .....           | 3,000        |
| Castile Creek .....                           | W., St. L. & P. R. R. ....       | 854          |
| Cedar City, 2d bottom of Missouri River ..... | L. & M. R. R. R. ....            | 550          |
| Centralia .....                               | W., St. L. & P. R. R. ....       | 879          |
| Centretown .....                              | Toner .....                      | 856          |
| Centreview .....                              | Toner .....                      | 875          |
| Chamois .....                                 | Toner .....                      | 531          |
| Charleston .....                              | St. L., I. Mt. & S. R. R. ....   | 326          |
| Chillicothe .....                             | H. & St. J. R. R. ....           | 764          |
| Do.....H. & St. J. R. R. crossing .....       | W., St. L. & P. R. R. ....       | 746          |
| Chittenham .....                              | Toner .....                      | 458          |
| Clapper .....                                 | Mo., Kans. & Tex. R. R. ....     | 751          |
| Clarence .....                                | H. & St. J. R. R. ....           | 824          |
| Clark City .....                              | Mo., Iowa & Neb. R. R. ....      | 694          |
| Clifton .....                                 | W., St. L. & P. R. R. ....       | 722          |
| Clinton .....                                 | Mo., Kans. & Tex. R. R. ....     | 867          |
| Colvey .....                                  | St. L. & S. F. R. R. ....        | 497          |
| Como .....                                    | L. R. V. & Ark. R. R. ....       | 289          |
| Conception .....                              | W., St. L. & P. R. R. ....       | 1,018        |
| Converse .....                                | W., St. L. & P. R. R. ....       | 1,075        |
| Conway .....                                  | St. L. & S. F. R. R. ....        | 1,408        |
| Corn .....                                    | B. & S. R. R. ....               | 789          |
| Corning .....                                 | K. C., St. J. & C. B. R. R. .... | 876          |
| Cote Ronde .....                              | Toner .....                      | 732          |
| Craig .....                                   | K. C., St. J. & C. B. R. R. .... | 871          |
| Crocker .....                                 | St. L. & S. F. R. R. ....        | 1,132        |
| Crooked Creek Valley .....                    | St. L., S. & L. R. R. R. ....    | 881          |
| Cuba .....                                    | St. L. & S. F. R. R. ....        | 1,010        |
| Dalton .....                                  | W., St. L. & P. R. R. ....       | 637          |
| Dardenne, high water .....                    | W., St. L. & P. R. R. ....       | 438          |
| Darley .....                                  | Toner .....                      | 1,627        |
| Dayton .....                                  | St. L. & S. F. R. R. ....        | 947          |
| Deem's Branch .....                           | Toner .....                      | 1,205        |
| Deerfield .....                               | Mo., Kans. & Tex. R. R. ....     | 791          |
| De Lassus .....                               | St. L., I. Mt. & S. R. R. ....   | 889          |
| Des Arc .....                                 | St. L., I. Mt. & S. R. R. ....   | 547          |
| De Soto .....                                 | St. L., I. Mt. & S. R. R. ....   | 497          |
| De Witt .....                                 | W., St. L. & P. R. R. ....       | 644          |
| Dexter .....                                  | St. L., I. Mt. & S. R. R. ....   | 377          |
| Dillon .....                                  | St. L. & S. F. R. R. ....        | 1,193        |
| Dixon .....                                   | St. L. & S. F. R. R. ....        | 1,215        |
| Dorchester .....                              | St. L. & S. F. R. R. ....        | 1,305        |

| Station.                                                  | Authority.                       | Elevation.   |
|-----------------------------------------------------------|----------------------------------|--------------|
|                                                           |                                  | <i>Feet.</i> |
| .....                                                     | Toner .....                      | 870          |
| .....                                                     | Mo., Iowa & Neb. R. R. ....      | 869          |
| .....                                                     | Toner .....                      | 455          |
| .....                                                     | St. L. & S. F. R. R. ....        | 835          |
| .....                                                     | Smithsonian Inst .....           | 536          |
| .....                                                     | C. G. & S. L. R. R. ....         | 329          |
| worth depot. ....                                         | K. C., S. J. & C. B. R. R. ....  | 764          |
| .....                                                     | H. & St. J. R. R. ....           | 912          |
| .....                                                     | B. & M. R. R. R. ....            | 738          |
| rie .....                                                 | St. L. & S. F. R. R. ....        | 1,409        |
| .....                                                     | Toner .....                      | 715          |
| .....                                                     | H. & St. J. R. R. ....           | 731          |
| .....                                                     | W., St. L. & P. R. R. ....       | 866          |
| .....                                                     | Mo., Kans. & Tex. R. R. ....     | 662          |
| .....                                                     | Mo., Kans. & Tex. R. R. ....     | 731          |
| .....                                                     | .....                            | 977          |
| .....                                                     | H. & C. M. R. R. ....            | 518          |
| .....                                                     | Toner .....                      | 977          |
| .....                                                     | Toner .....                      | 885          |
| .....                                                     | Mo., Kans. & Tex. R. R. ....     | 657          |
| .....                                                     | W., St. L. & P. R. R. ....       | 505          |
| .....                                                     | K. C., St. J. & C. B. R. R. .... | 848          |
| .....                                                     | K. C., St. J. & C. B. R. R. .... | 859          |
| .....                                                     | Mo., Kans. & Tex. R. R. ....     | 591          |
| .....                                                     | St. L. & S. F. R. R. ....        | 936          |
| .....                                                     | W., St. L. & P. R. R. ....       | 957          |
| n .....                                                   | St. L., I. Mt. & S. R. R. ....   | 721          |
| .....                                                     | L. & M. R. R. R. ....            | 843          |
| .....                                                     | St. L., I. Mt. & S. R. R. ....   | 843          |
| .....                                                     | .....                            | 785          |
| .....                                                     | Toner .....                      | 483          |
| .....                                                     | L. & L. M. R. R. R. ....         | 630          |
| .....                                                     | St. L., I. Mt. & S. R. R. ....   | 458          |
| .....                                                     | Toner .....                      | 568          |
| action .....                                              | W., St. L. & P. R. R. ....       | 998          |
| ..... cross St. L., K. C. & N.<br>R. R. at grade.         | Mo., Iowa & Neb. R. R. ....      | 990          |
| .....                                                     | W., St. L. & P. R. R. ....       | 935          |
| .....                                                     | St. L. & S. F. R. R. ....        | 1,027        |
| .....                                                     | St. L. & S. F. R. R. ....        | 1,363        |
| .....                                                     | Mo., Iowa & Neb. R. R. ....      | 759          |
| .....                                                     | St. L., I. Mt. & S. R. R. ....   | 300          |
| .....                                                     | Smithsonian Inst .....           | 1,800        |
| landing .....                                             | Toner .....                      | 320          |
| .....                                                     | St. L. & S. F. R. R. ....        | 1,374        |
| .....                                                     | Mo., Kans. & Tex. R. R. ....     | 903          |
| .....                                                     | W., St. L. & P. R. R. ....       | 992          |
| .....                                                     | Toner .....                      | 907          |
| .....                                                     | Toner .....                      | 531          |
| .....                                                     | K. C., St. J. & C. B. R. R. .... | 803          |
| .....                                                     | Mo., Kans. & Tex. R. R. ....     | 772          |
| .....                                                     | H. & St. J. R. R. ....           | 804          |
| .....                                                     | H. & St. J. R. R. ....           | 987          |
| .....                                                     | St. L. & S. F. R. R. ....        | 1,109        |
| ossing H. & St. J. R. R. ....                             | H. & N. R. R. ....               | 470          |
| h water Mississippi River, 1851                           | H. & St. J. R. R. ....           | 469          |
| h water Mississippi River, 1851.                          | H. & St. J. R. R. ....           | 447          |
| ot .....                                                  | H. & St. J. R. R. ....           | 470          |
| action with H. & St. J., B. &<br>do. R. & T. W. & W. R. R | Mo., Kans. & Tex. R. R. ....     | 469          |
| .....                                                     | H. & St. J. R. R. ....           | 735          |
| .....                                                     | K. C., St. J. & C. B. R. R. .... | 746          |
| shore .....                                               | K. C., St. J. & C. B. R. R. .... | 749          |

| Station.                                       | Authority.                         | Elevation.   |
|------------------------------------------------|------------------------------------|--------------|
|                                                |                                    | <i>Fect.</i> |
| Harris.....                                    | Mo., Kans. & Tex. R. R.....        | 853          |
| Hassard.....                                   | Mo., Kans. & Tex. R. R.....        | 742          |
| Hematite.....                                  | .....                              | 475          |
| Hendrickson.....                               | St. L., I. Mt. & S. R. R.....      | 373          |
| Hermann.....                                   | Smithsonian Inst.....              | 598          |
| Hermitage.....                                 | Toner.....                         | 1,037        |
| Do.....                                        | St. L. & S. F. R. R.....           | 1,045        |
| Hibernia.....                                  | L. & M. R. R. R.....               | 860          |
| Higbee.....                                    | Mo., Kans. & Tex. R. R.....        | 877          |
| Higginsville, Lex. & St. L. R. R.....          | L. & M. R. R. R.....               | 647          |
| Hogan.....                                     | St. L., I. Mt. & S. R. R.....      | 892          |
| Holt.....                                      | H. & St. J. R. R.....              | 861          |
| Hopewell Summit.....                           | St. L., I. Mt. & S. R. R.....      | 966          |
| Hopkins.....                                   | K. C., St. J. & C. B. R. R.....    | 1,048        |
| Howard.....                                    | R. H. R. R.....                    | 901          |
| Howland.....                                   | B. & S. R. R.....                  | 963          |
| Hunnewell.....                                 | H. & St. J. R. R.....              | 755          |
| Hunterville.....                               | W., St. L. & P. R. R.....          | 795          |
| Independence.....                              | L. & M. R. R. R.....               | 995          |
| Iron Centre.....                               | St. L. & S. F. R. R.....           | 1,036        |
| Irondale.....                                  | St. L., I. Mt. & S. R. R.....      | 796          |
| Iron Mountain Station.....                     | St. L., I. Mt. & S. R. R.....      | 1,077        |
| Iron Switch.....                               | St. L. & S. F. R. R.....           | 1,093        |
| Ironton.....                                   | St. L., I. Mt. & S. R. R.....      | 919          |
| Jacksonville.....                              | W., St. L. & P. R. R.....          | 861          |
| Jameson.....                                   | W., St. L. & P. R. R.....          | 793          |
| Jefferson Barracks.....                        | St. L., I. Mt. & S. R. R.....      | 418          |
| Jerome.....                                    | St. L. & S. F. R. R.....           | 693          |
| Joplin.....                                    | S. C. & J. R. R.....               | 1,018        |
| Kansas City, Union Depot.....                  | Mean result from R. R. levels..... | 743          |
| Do..... Grand avenue.....                      | U. T. Co. R. R.....                | 783          |
| Do..... high water, 1844.....                  | H. & St. J. R. R.....              | 752          |
| Do..... Missouri River, opposite.....          | W., St. L. & P. R. R.....          | 746          |
| Do..... high water, south pier of.....         | .....                              | .....        |
| Do..... bridge.....                            | K. C., St. J. & C. B. R. R.....    | 753          |
| Do..... track on bridge.....                   | K. C., St. J. & C. B. R. R.....    | 768          |
| Kearney.....                                   | H. & St. J. R. R.....              | 827          |
| Keytesville, bottom Chariton.....              | W., St. L. & P. R. R.....          | 635          |
| Kidder.....                                    | H. & St. J. R. R.....              | 1,017        |
| Kimmswick.....                                 | St. L., I. Mt. & S. R. R.....      | 415          |
| King's Prairie.....                            | St. L. & S. F. R. R.....           | 1,442        |
| Kingsville.....                                | Toner.....                         | 924          |
| Kirksville.....                                | W., St. L. & P. R. R.....          | 975          |
| Do..... junction Saint Louis, Kansas City..... | .....                              | .....        |
| Do..... & Northern Railroad.....               | B. & M. R. R. R.....               | 975          |
| Kirkwood.....                                  | Toner.....                         | 636          |
| Knob Lick.....                                 | St. L., I. Mt. & S. R. R.....      | 926          |
| Knobnoster.....                                | Toner.....                         | 822          |
| Knobview.....                                  | St. L. & S. F. R. R.....           | 1,064        |
| Knox.....                                      | B. & M. R. R. R.....               | 768          |
| Labadie.....                                   | Toner.....                         | 486          |
| La Belle.....                                  | B. & M. R. R. R.....               | 741          |
| La Clede.....                                  | B. & S. R. R.....                  | 786          |
| Do..... crossing B. & S. W., grade at.....     | H. & St. J. R. R.....              | 787          |
| La Due.....                                    | Mo., Kans. & Tex. R. R.....        | 745          |
| Lafin.....                                     | St. L., I. Mt. & S. R. R.....      | 287          |
| Lakenan.....                                   | H. & St. J. R. R.....              | 729          |
| Lake Station, side track.....                  | K. C., St. J. & C. B. R. R.....    | 826          |
| Do..... crossing H. & St. J. R. R.....         | K. C., St. J. & B. R. R.....       | 829          |
| Lakeville.....                                 | C. G. & S. L. R. R.....            | 351          |
| La Monte.....                                  | Toner.....                         | 878          |
| Lancaster.....                                 | Mo., Iowa & Neb. R. R.....         | 972          |
| Lanson.....                                    | W., St. L. & P. R. R.....          | 1,050        |
| La Plata.....                                  | W., St. L. & P. R. R.....          | 940          |

| Station.                                   | Authority.                      | Elevation.   |
|--------------------------------------------|---------------------------------|--------------|
|                                            |                                 | <i>Feet.</i> |
| p.....                                     | W., St. L. & P. R. R.....       | 948          |
| rg.....                                    | St. L. & S. F. R. R.....        | 1,030        |
| n.....                                     | St. L. & S. F. R. R.....        | 1,269        |
| .....                                      | B. & S. R. R.....               | 1,078        |
| .....                                      | H. & St. J. R. R.....           | 790          |
| .....                                      | Mo., Kans. & Tex. R. R.....     | 785          |
| rairie.....                                | L. R. V. & Ark. R. R.....       | 311          |
| .....                                      | H. & St. J. R. R.....           | 846          |
| Landing.....                               | W., St. L. & P. R. R.....       | 735          |
| .....                                      | H. & St. J. R. R.....           | 809          |
| .....                                      | B. & S. R. R.....               | 425          |
| liver.....                                 | L. R. V. & Ark. R. R.....       | 290          |
| .....                                      | St. L. & S. F. R. R.....        | 1,370        |
| na.....                                    | L. & M. R. R. R.....            | 460          |
| ...top of bluffs.....                      | L. & M. R. R. R.....            | 650          |
| ake.....                                   | W., St. L. & P. R. R.....       | 896          |
| .....                                      | Mo., Iowa & Neb. R. R.....      | 737          |
| .....                                      | W., St. L. & P. R. R.....       | 980          |
| cross. St. L., K. C. & N. R. R., where     |                                 |              |
| is 22.5 feet higher.....                   | H. & St. J. R. R.....           | 864          |
| depot.....                                 | H. & St. J. R. R.....           | 867          |
| k's.....                                   | Toner.....                      | 585          |
| a.....                                     | Mo., Kans. & Tex. R. R.....     | 772          |
| .....                                      | L. R. V. & Ark. R. R.....       | 297          |
| Creek.....                                 | W., St. L. & P. R. R.....       | 854          |
| Hill.....                                  | Toner.....                      | 411          |
| sville.....                                | St. L. & S. F. R. R.....        | 1,338        |
| nd.....                                    | St. L., I. Mt. & S. R. R.....   | 570          |
| ll.....                                    | L. & M. R. R. R.....            | 578          |
| eld.....                                   | St. L. & S. F. R. R.....        | 1,483        |
| ille.....                                  | K. C., St. J. & C. B. R. R..... | 1,037        |
| Summit.....                                | W., St. L. & P. R. R.....       | 1,027        |
| od Station.....                            | B. & M. R. R. R.....            | 524          |
| lle.....                                   | H. & St. J. R. R.....           | 729          |
| is, county-seat.....                       | Mo., Iowa & Neb. R. R.....      | 749          |
| ...town.....                               | Mo., Iowa & Neb. R. R.....      | 787          |
| a.....                                     | B. & S. R. R.....               | 885          |
| co.....                                    | Toner.....                      | 435          |
| ae.....                                    | Toner.....                      | 419          |
| .....                                      | W., St. L. & P. R. R.....       | 798          |
| brook.....                                 | Toner.....                      | 1,144        |
| .....                                      | B. & S. R. R.....               | 840          |
| .....                                      | W., S. L. & P. R. R.....        | 970          |
| Landing.....                               | Toner.....                      | 508          |
| ring.....                                  | St. L., I. Mt. & S. R. R.....   | 443          |
| Point.....                                 | St. L., I. Mt. & S. R. R.....   | 863          |
| .....                                      | C. G. & S. L. R. R.....         | 338          |
| Swamp.....                                 | C. G. & S. L. R. R.....         | 326          |
| i City.....                                | W., St. L. & P. R. R.....       | 722          |
| f.....                                     | W., St. L. & P. R. R.....       | 867          |
| ...junc. with St. L., K. C. & N. R. R..... | Mo., Kans. & Tex. R. R.....     | 865          |
| au.....                                    | Toner.....                      | 904          |
| .....                                      | Mo., Kans. & Tex. R. R.....     | 728          |
| mery City.....                             | W., St. L. & P. R. R.....       | 831          |
| se.....                                    | Mo., Kans. & Tex. R. R.....     | 824          |
| .....                                      | H. & St. J. R. R.....           | 473          |
| ville.....                                 | H. & St. J. R. R.....           | 921          |
| n.....                                     | Toner.....                      | 522          |
| .....                                      | St. L., I. Mt. & S. R. R.....   | 345          |
| .....                                      | St. L. & S. F. R. R.....        | 500          |
| .....                                      | H. & St. J. R. R.....           | 734          |
| ville.....                                 | St. L., I. Mt. & S. R. R.....   | 306          |

(285)



| Station.                                   | Authority.                       | Elevation.   |
|--------------------------------------------|----------------------------------|--------------|
|                                            |                                  | <i>Feet.</i> |
| Neosho .....                               | St. L. & S. F. R. R. ....        | 1,021        |
| Nettleton .....                            | H. & St. J. R. R. ....           | 958          |
| Nevada .....                               | Mo., Kans. & Tex. R. R. ....     | 870          |
| New Bourbon .....                          | Toner .....                      | 641          |
| New Cambria .....                          | H. & St. J. R. R. ....           | 821          |
| New Madrid .....                           | L. R. V. & Ark. R. R. ....       | 299          |
| Newport .....                              | Toner .....                      | 482          |
| New Springfield .....                      | Toner .....                      | 1,532        |
| Niangua .....                              | St. L. & S. F. R. R. ....        | 1,428        |
| Nibbard .....                              | W., St. L. & P. R. R. ....       | 1,051        |
| Nishnabotna, side track .....              | K. C., St. J. & C. B. R. R. .... | 879          |
| Nodaway, side track .....                  | K. C., St. J. & C. B. R. R. .... | 830          |
| North Lexington, bank Missouri River ..... | W., St. L. & P. R. R. ....       | 693          |
| North Mo. Junction .....                   | W., St. L. & P. R. R. ....       | 741          |
| North River .....                          | H. & St. J. R. R. ....           | 479          |
| Nosborne .....                             | W., St. L. & P. R. R. ....       | 707          |
| Oakland .....                              | Toner .....                      | 611          |
| Ogden .....                                | Toner .....                      | 500          |
| Ohio City .....                            | Toner .....                      | 505          |
| Oregon .....                               | Toner .....                      | 1,100        |
| Osage City .....                           | Toner .....                      | 541          |
| Osborne .....                              | H. & St. J. R. R. ....           | 1,036        |
| Otterville .....                           | Toner .....                      | 695          |
| Pacific City .....                         | St. L. & S. F. R. R. ....        | 457          |
| Palmyra Junction .....                     | H. & St. J. R. R. ....           | 649          |
| Paris .....                                | Mo., Kans. & Tex. R. R. ....     | 651          |
| Parkville .....                            | K. C., St. J. & C. B. R. R. .... | 753          |
| Pattonsburgh .....                         | W., St. L. & P. R. R. ....       | 772          |
| Pendleton (summit) .....                   | W., St. L. & P. R. R. ....       | 915          |
| Pevely .....                               | St. L., I. Mt. & S. R. R. ....   | 441          |
| Phelps .....                               | K. C., St. J. & C. B. R. R. .... | 896          |
| Pickering .....                            | K. C., St. J. & C. B. R. R. .... | 1,023        |
| Piedmont .....                             | St. L., I. Mt. & S. R. R. ....   | 503          |
| Pierce City .....                          | St. L. & S. F. R. R. ....        | 1,176        |
| Pilot Grove .....                          | Mo., Kans. & Tex. R. R. ....     | 832          |
| Platte River .....                         | W., St. L. & P. R. R. ....       | 819          |
| Plattsburgh .....                          | W., St. L. & P. R. R. ....       | 948          |
| Pleasant Green .....                       | Mo., Kans. & Tex. R. R. ....     | 775          |
| Plymouth .....                             | St. L. & S. F. R. R. ....        | 1,326        |
| Pollock .....                              | B. & S. R. R. ....               | 943          |
| Poplar Bluff .....                         | St. L., I. Mt. & S. R. R. ....   | 343          |
| Do.....bank Black River .....              | C. G. & S. L. R. R. ....         | 326          |
| Prairie City .....                         | .....                            | 771          |
| Prairie Lick .....                         | Mo., Kans. & Tex. R. R. ....     | 696          |
| Purdin .....                               | B. & S. R. R. ....               | 887          |
| Queen City .....                           | W., St. L. & P. R. R. ....       | 1,004        |
| Reelsville .....                           | .....                            | 599          |
| Reeves .....                               | Toner .....                      | 372          |
| Rensselaer .....                           | Mo., Kans. & Tex. R. R. ....     | 733          |
| Rhineland .....                            | Smithsonian Inst .....           | 800          |
| Rich Hill .....                            | R. H. R. R. ....                 | 784          |
| Richland .....                             | St. L. & S. F. R. R. ....        | 1,143        |
| Richmond .....                             | W., St. L. & P. R. R. ....       | 809          |
| Richmond and Lexington Junction .....      | W., St. L. & P. R. R. ....       | 699          |
| Ritchey .....                              | St. L. & S. F. R. R. ....        | 1,066        |
| Robertson .....                            | H. & St. J. R. R. ....           | 870          |
| Rockville .....                            | Mo., Kans. & Tex. R. R. ....     | 771          |
| Rolla .....                                | St. L. & S. F. R. R. ....        | 1,086        |
| Roseberry .....                            | W., St. L. & P. R. R. ....       | 977          |
| Rosedale .....                             | K. C., Ft. S. & G. R. R. ....    | 795          |
| Rosehill .....                             | Toner .....                      | 595          |
| Rosendale .....                            | K. C., St. J. & C. B. R. R. .... | 923          |
| Round Grove .....                          | H. & St. J. R. R. ....           | 836          |

| Station.                                           | Authority.                       | Elevation.   |
|----------------------------------------------------|----------------------------------|--------------|
|                                                    |                                  | <i>Feet.</i> |
| Rushville .....                                    | K. C., St. J. & C. B. R. R. .... | 798          |
| Russell .....                                      | Mo., Kans. & Tex. R. R. ....     | 780          |
| St. Aubert .....                                   | Toner .....                      | 527          |
| St. Catherine .....                                | H. & St. J. R. R. ....           | 797          |
| St. Charles, bank Missouri River, opposite.        | W., St. L. & P. R. R. ....       | 444          |
| Do .....                                           | W., St. L. & P. R. R. ....       | 504          |
| St. Clair .....                                    | St. L. & S. F. R. R. ....        | 759          |
| St. Francisville .....                             | C. G. & S. L. R. R. ....         | 333          |
| St. Genevieve .....                                | Toner .....                      | 372          |
| St. James .....                                    | St. L. & S. F. R. R. ....        | 1,117        |
| St. Joseph, bank Missouri River .....              | W., St. L. & P. R. R. ....       | 823          |
| Do .....                                           | K. C., St. J. & C. B. R. R. .... | 826          |
| Do .....                                           | K. C., St. J. & C. B. R. R. .... | 824          |
| Do .....                                           | St. J. & D. C. R. R. ....        | 792          |
| Do .....                                           | St. J. & D. C. R. R. ....        | 812          |
| Do .....                                           | H. & St. J. R. R. ....           | 825          |
| Do .....                                           | H. & St. J. R. R. ....           | 827          |
| Do .....                                           | H. & St. J. R. R. ....           | 839          |
| St. Louis, old station .....                       | St. L., I. Mt. & S. R. R. ....   | 418          |
| Do .....                                           | Levels of Miss. River Com. ....  | 413          |
| Do .....                                           | U. S. C. & G. S. ....            | 416          |
| Do .....                                           | City Engineer .....              | 431          |
| Do .....                                           | St. L., V. & T. H. R. R. ....    | 470          |
| Do .....                                           | City Engineer .....              | 428          |
| Do .....                                           | City Engineer .....              | 379          |
| Do .....                                           | St. L., V. & T. H. R. R. ....    | 363          |
| Do .....                                           | U. S. C. & G. S. ....            | 461          |
| Do .....                                           | U. S. Signal Office .....        | 568          |
| St. Paul .....                                     | Toner .....                      | 428          |
| Salem .....                                        | St. L., S. & L. R. R. ....       | 1,182        |
| Salina City .....                                  | L. & M. R. R. ....               | 850          |
| Salisbury Junction .....                           | W., St. L. & P. R. R. ....       | 721          |
| Satan .....                                        | K. C., St. J. & C. B. R. R. .... | 709          |
| Savannah, new station .....                        | K. C., St. J. & C. B. R. R. .... | 1,100        |
| Do .....                                           | K. C., St. J. & C. B. R. R. .... | 1,023        |
| Saxton .....                                       | H. & St. J. R. R. ....           | 881          |
| Schell City .....                                  | Mo., Kans. & Tex. R. R. ....     | 754          |
| Schockley's Gat. ....                              | St. L. & S. F. R. R. ....        | 1,367        |
| Scott's .....                                      | Toner .....                      | 622          |
| Scottdale, junction M. P. & St. L. & L. R. R. .... | Mo., Kans. & Tex. R. R. ....     | 907          |
| Seneca .....                                       | St. L. & S. F. R. R. ....        | 851          |
| Shawnee .....                                      | K. C., Ft. S. & G. R. R. ....    | 921          |
| Shelbina .....                                     | H. & St. J. R. R. ....           | 779          |
| Sikeston .....                                     | St. L., I. Mt. & S. R. R. ....   | 330          |
| Simmon's Mountain .....                            | St. L., S. & L. R. R. ....       | 1,250        |
| Sleeper .....                                      | St. L. & S. F. R. R. ....        | 1,209        |
| Smith's Fork .....                                 | W., St. L. & P. R. R. ....       | 879          |
| Smithton .....                                     | Toner .....                      | 888          |
| South Point .....                                  | Toner .....                      | 510          |
| Sprague .....                                      | R. H. R. R. ....                 | 917          |
| Spring Creek .....                                 | St. L., S. & L. R. R. ....       | 1,123        |
| Springfield .....                                  | St. L. & S. F. R. R. ....        | 1,352        |
| Stafford .....                                     | St. L. & S. F. R. R. ....        | 1,479        |
| Stanberry .....                                    | W., St. L. & P. R. R. ....       | 876          |
| Stanton .....                                      | St. L. & S. F. R. R. ....        | 867          |
| Stewartsville .....                                | H. & St. J. R. R. ....           | 958          |
| Stockton .....                                     | Smithsonian Inst. ....           | 800          |
| Stoutville .....                                   | St. L. & S. F. R. R. ....        | 1,166        |
| Stoutsville .....                                  | Mo., Kans. & Tex. R. R. ....     | 605          |
| Sturgeon .....                                     | W., St. L. & P. R. R. ....       | 847          |
| Sugar Lake .....                                   | K., C. St. J. & C. B. R. R. .... | 794          |
| Sullivan .....                                     | St. L. & S. F. R. R. ....        | 967          |
| Sulphur Springs .....                              | St. L., I. Mt. & S. R. R. ....   | 411          |

| Station.                               | Authority.                      | Elevation.   |
|----------------------------------------|---------------------------------|--------------|
|                                        |                                 | <i>Feet.</i> |
| Sutton.....                            | Toner.....                      | 470          |
| Sylvania.....                          | Toner.....                      | 339          |
| Syracuse.....                          | Toner.....                      | 944          |
| Talbott.....                           | Mo., Kans. & Tex. R. R.....     | 620          |
| Tailors.....                           | St. L. & S. F. R. R.....        | 1,004        |
| Taylorville.....                       | Toner.....                      | 470          |
| Tipton.....                            | Toner.....                      | 944          |
| Tip-top Summit.....                    | St. L., I. Mt. & S. R. R.....   | 1,200        |
| Tolona.....                            | B. & M. R. R. R.....            | 697          |
| Tower Grove.....                       | Smithsonian Inst.....           | 500          |
| Turnback Summit.....                   | St. L. & S. F. R. R.....        | 1,383        |
| Turney.....                            | H. & St. J. R. R.....           | 1,048        |
| Tusculum.....                          | Smithsonian Inst.....           | 600          |
| Union.....                             | Smithsonian Inst.....           | 616          |
| Unionville.....                        | B. & S. R. R.....               | 1,068        |
| Utica.....                             | H. & St. J. R. R.....           | 739          |
| Verona.....                            | St. L. & S. F. R. R.....        | 1,262        |
| Waldron.....                           | K. C., St. J. & C. B. R. R..... | 757          |
| Walker's.....                          | Mo., Kans. & Tex. R. R.....     | 856          |
| Warrenton.....                         | W., St. L. & P. R. R.....       | 853          |
| Washington.....                        | Toner.....                      | 487          |
| Watson.....                            | K. C., St. J. & C. B. R. R..... | 904          |
| Wayland.....                           | Mo., Iowa & Neb. R. R.....      | 531          |
| Webster.....                           | Toner.....                      | 525          |
| Wellsburgh.....                        | Toner.....                      | 778          |
| Weston.....                            | K. C., St. J. & C. B. R. R..... | 773          |
| West Plattsburgh, summit.....          | W., St. L. & P. R. R.....       | 1,020        |
| West Quincy.....                       | H. & St. J. R. R.....           | 483          |
| Do.....high-water in Missouri River..  | H. & St. J. R. R.....           | 477          |
| Do.....junction with H. & S. J. R. R.. | B. & M. R. R. R.....            | 489          |
| Wheeling.....                          | H. & St. J. R. R.....           | 740          |
| Williamsville.....                     | St. L., I. Mt. & S. R. R.....   | 401          |
| Windsor.....                           | Mo., Kans. & Tex. R. R.....     | 875          |
| Windthrop.....                         | H. & St. J. R. R.....           | 801          |
| Winthrop, junction.....                | K. C., St. J. & C. B. R. R..... | 789          |
| Do.....depot.....                      | K. C., St. J. & C. B. R. R..... | 789          |
| Do.....top of rail C. & A. bridge..... | K. C., St. J. & C. B. R. R..... | 798          |
| Do.....crossing R. I. & P. R. R.....   | K. C., St. J. & C. B. R. R..... | 782          |
| Woodend.....                           | St. L. & S. F. R. R.....        | 1,113        |
| Woodland.....                          | H. & St. J. R. R.....           | 679          |
| Yeatman.....                           | Toner.....                      | 485          |

# MONTANA.

| Station.                                | Authority.                     | Elevation.   |
|-----------------------------------------|--------------------------------|--------------|
|                                         |                                | <i>Fect.</i> |
| Ainslie .....                           | N. P. R. R. ....               | 2,272        |
| Allard .....                            | N. P. R. R. ....               | 2,299        |
| Allen's Ranch .....                     | Hayden .....                   | 4,396        |
| Argenta .....                           | De Lacy .....                  | 6,337        |
| Arlee .....                             | N. P. R. R. ....               | 3,057        |
| Arrow Peak .....                        | N. P. Transcontinental Survey. | 7,420        |
| Assinaboine, Fort, Signal Station ..... | U. S. Signal Office.....       | 2,650        |
| Avon .....                              | N. P. R. R. ....               | 4,675        |
| Baker, Camp .....                       | Ludlow .....                   | 4,538        |
| Bannack .....                           | De Lacy .....                  | 5,896        |
| Barrett's Ranch .....                   | De Lacy .....                  | 5,665        |
| Basin Station .....                     | De Lacy .....                  | 5,437        |
| Bearmouth .....                         | N. P. R. R. ....               | 3,787        |
| Beaver Creek .....                      | N. P. R. R. ....               | 2,639        |
| Beaverhead .....                        | Hayden .....                   | 4,464        |
| Do .....                                | De Lacy .....                  | 4,888        |
| Bedford .....                           | Pre. R. R. levels .....        | 3,845        |
| Belgrade .....                          | N. P. R. R. ....               | 4,435        |
| Belknap .....                           | N. P. R. R. ....               | 2,405        |
| Benton .....                            | N. P. Transcontinental Survey. | 2,600        |
| Benton, Fort, Signal Station .....      | U. S. Signal Office .....      | 2,674        |
| Big Horn .....                          | N. P. R. R. ....               | 2,688        |
| Big Timber .....                        | N. P. R. R. ....               | 4,070        |
| Billings .....                          | N. P. R. R. ....               | 3,115        |
| Bitter-root .....                       |                                | 2,480        |
| Black Butte .....                       | N. P. Transcontinental Survey. | 5,540        |
| Blackfoot Agency .....                  |                                | 3,169        |
| Blackmore, Mount.....                   | Hayden .....                   | 10,134       |
| Do..... Timber line on.....             | Hayden .....                   | 9,550        |
| Bonita .....                            | N. P. R. R. ....               | 3,564        |
| Boteler's Ranch .....                   | Hayden .....                   | 4,825        |
| Do .....                                | Ludlow .....                   | 4,873        |
| Boulder City (opposite).....            | Pre. R. R. levels .....        | 4,904        |
| Bouldertown .....                       | De Lacy .....                  | 5,000        |
| Boundary Pass .....                     | P. R. R. Reports.....          | 6,030        |
| Bozeman .....                           | Hayden .....                   | 4,900        |
| Do .....                                | Wheeler .....                  | 4,839        |
| Do .....                                | N. P. R. R. ....               | 4,752        |
| Brewer's Springs .....                  | Ludlow .....                   | 4,957        |
| Bridger's Pass .....                    | Ludlow .....                   | 6,147        |
| Do... Peak .....                        | N. P. Transcontinental Survey. | 9,106        |
| Do... do .....                          | Hayden .....                   | 9,002        |
| Butler .....                            | N. P. R. R. ....               | 4,725        |
| Cabinet .....                           | N. P. R. R. ....               | 12,187       |
| Cadotte's Pass .....                    | Pacific R. R. Reports .....    | 6,044        |
| Cantonment Jordan .....                 |                                | 2,990        |
| Carroll .....                           | Ludlow .....                   | 2,247        |
| Castle Rock .....                       | N. P. Transcontinental Survey. | 4,947        |
| Clancy .....                            | Pre. R. R. levels .....        | 4,262        |
| Clark's Fork .....                      | N. P. R. R. ....               | 2,086        |
| Clasall .....                           | N. P. R. R. ....               | 4,123        |
| Coal Spur .....                         | N. P. R. R. ....               | 4,735        |
| Cone Butte .....                        | N. P. Transcontinental Survey. | 5,820        |
| Conical Peak .....                      | N. P. Transcontinental Survey. | 10,737       |
| Cook's Ranch .....                      | De Lacy .....                  | 4,995        |
| Coriscan Deifle Pass .....              | N. P. R. R. ....               | 3,946        |
| Cowan, Mount .....                      | Hayden .....                   | 10,351       |
| Crazy Peak .....                        | N. P. Transcontinental Survey. | 11,178       |

| Station.                                                  | Authority.                          | Elevation.   |
|-----------------------------------------------------------|-------------------------------------|--------------|
|                                                           |                                     | <i>Feet.</i> |
| Custer .....                                              | N. P. R. R. ....                    | 2,725        |
| Deer Lodge .....                                          | Stewart .....                       | 4,768        |
| Deer Lodge Pass .....                                     | N. P. R. R. Surveys .....           | 5,806        |
| Delano, Mount .....                                       | Hayden .....                        | 10,200       |
| Do. .... Timber line on .....                             | Hayden .....                        | 8,784        |
| De Sniet .....                                            | N. P. R. R. ....                    | 3,213        |
| Dixon .....                                               | N. P. R. R. ....                    | 2,320        |
| Drummond .....                                            | N. P. R. R. ....                    | 3,943        |
| Eddy .....                                                | N. P. R. R. ....                    | 2,415        |
| Electric Peak .....                                       | Hayden .....                        | 11,155       |
| Do. .... Timber line on .....                             | Hayden .....                        | 9,443        |
| Elk Peak .....                                            | N. P. Transcontinental Survey ..... | 8,606        |
| Ellis, Fort .....                                         | Hayden .....                        | 4,935        |
| Do. ....                                                  | Ludlow .....                        | 4,747        |
| Ellis, Mount .....                                        | N. P. Transcontinental Survey ..... | 8,419        |
| Elliston .....                                            | N. P. R. R. ....                    | 5,036        |
| Elton .....                                               | N. P. R. R. ....                    | 4,220        |
| Emigrant Peak .....                                       | Hayden .....                        | 11,034       |
| Evaro .....                                               | N. P. R. R. ....                    | 3,946        |
| Fallon .....                                              | N. P. R. R. ....                    | 2,206        |
| Fish Creek Station .....                                  |                                     | 4,134        |
| Flathead Lake .....                                       | Pacific R. R. Reports .....         | 2,800        |
| Do. . Pass, Bridger range .....                           | Hayden .....                        | 6,769        |
| Forsyth .....                                             | N. P. R. R. ....                    | 2,513        |
| Gaffney's Station .....                                   | De Lacy .....                       | 4,838        |
| Gallatin .....                                            | N. P. R. R. ....                    | 4,030        |
| Do. ....                                                  | Hayden .....                        | 4,133        |
| Garrison .....                                            | N. P. R. R. ....                    | 4,205        |
| Glendive .....                                            | N. P. R. R. ....                    | 2,067        |
| Gordon .....                                              | N. P. R. R. ....                    | 4,906        |
| Grayling .....                                            | U. & N. R. R. ....                  | 5,443        |
| Greycliff .....                                           | N. P. R. R. ....                    | 3,845        |
| Halfway House .....                                       | Pre. R. R. levels .....             | 4,157        |
| Hamilton .....                                            | Hayden .....                        | 4,342        |
| Do. ....                                                  | N. P. R. R. ....                    | 4,240        |
| Hamilton's, Jeff. Davis Gulch .....                       | De Lacy .....                       | 6,536        |
| Hathaway .....                                            | N. P. R. R. ....                    | 2,426        |
| Helena .....                                              | Hayden .....                        | 4,266        |
| Do. ....                                                  | N. P. R. R. ....                    | 3,930        |
| Do. ....                                                  | De Lacy .....                       | 4,296        |
| Do. B. M. in .....                                        | Pre. R. R. levels .....             | 4,061        |
| Do. corner stone in basement of old<br>school house ..... | Pre. R. R. levels .....             | 4,149        |
| Do. Signal Station .....                                  | U. S. Signal Office .....           | 4,262        |
| Hellgate .....                                            | Toner .....                         | 3,318        |
| Heron .....                                               | N. P. R. R. ....                    | 2,261        |
| Highwood Peak .....                                       | N. P. Transcontinental Survey ..... | 7,604        |
| Hilgard, Mount .....                                      | Hayden .....                        | 11,000       |
| Hodges .....                                              | N. P. R. R. ....                    | 2,535        |
| Hope .....                                                | N. P. R. R. ....                    | 2,108        |
| Hopley's Hole .....                                       | Ludlow .....                        | 4,894        |
| Horse Plain .....                                         | N. P. R. R. ....                    | 2,463        |
| Horton .....                                              | N. P. R. R. ....                    | 2,390        |
| Howard .....                                              | N. P. R. R. ....                    | 2,559        |
| Huntley .....                                             | N. P. R. R. ....                    | 3,012        |
| Jefferson Bridge .....                                    | De Lacy .....                       | 4,672        |
| Jefferson City .....                                      | De Lacy .....                       | 4,776        |
| Jefferson City .....                                      | Pre. R. R. levels .....             | 4,575        |
| Jocko .....                                               | N. P. R. R. ....                    | 2,507        |
| Judith Gap .....                                          | N. P. Transcontinental Survey ..... | 4,650        |
| Judith Peak .....                                         | N. P. Transcontinental Survey ..... | 6,386        |
| Keogh, Fort .....                                         | N. P. R. R. ....                    | 2,365        |
| Last Spike .....                                          | N. P. R. R. ....                    | 4,253        |
| Laurel .....                                              | N. P. R. R. ....                    | 3,253        |

| Station.                     | Authority.                         | Elevation.   |
|------------------------------|------------------------------------|--------------|
|                              |                                    | <i>Feet.</i> |
| camp.....                    | Ludlow.....                        | 3,890        |
| and Clarke's Pass.....       | P. R. R. Reports.....              | 6,323        |
| Peak.....                    | Hayden.....                        | 9,162        |
| ackfoot Pass.....            | Pacific R. R. Reports.....         | 6,250        |
| on.....                      | N. P. R. R.....                    | 4,485        |
| 's.....                      | De Lacy.....                       | 4,992        |
| .....                        | De Lacy.....                       | 5,465        |
| n.....                       | N. P. R. R.....                    | 2,685        |
| 's Peak.....                 | Mullan.....                        | 7,500        |
| Pass.....                    | Pacific R. R. Reports.....         | 6,911        |
| , Fort.....                  | N. P. Transcontinental Survey..... | 4,310        |
| .....                        | N. P. Transcontinental Survey..... | 4,700        |
| ass.....                     | N. P. Transcontinental Survey..... | 8,500        |
| ile.....                     | N. P. Transcontinental Survey..... | 4,707        |
| y.....                       | N. P. R. R.....                    | 2,353        |
| .....                        | N. P. R. R.....                    | 2,114        |
| .....                        | N. P. R. R.....                    | 3,195        |
| Peak.....                    | N. P. Transcontinental Survey..... | 5,547        |
| .....                        | U. & N. R. R.....                  | 6,804        |
| City.....                    | De Lacy.....                       | 4,191        |
| .....                        | N. P. R. R.....                    | 2,245        |
| ate Springs.....             | Ludlow.....                        | 5,106        |
| .....                        | N. P. R. R.....                    | 5,500        |
| Pass.....                    | Mullan.....                        | 5,980        |
| tunnel summit.....           | N. P. R. R.....                    | 5,548        |
| .....                        | N. P. R. R.....                    | 2,657        |
| City.....                    | Hayden.....                        | 5,548        |
| .....                        | N. P. R. R.....                    | 2,186        |
| y.....                       | Hayden.....                        | 9,711        |
| .....                        | N. P. Transcontinental Survey..... | 4,540        |
| ort.....                     | Toner.....                         | 3,284        |
| Rock.....                    | N. P. R. R.....                    | 3,953        |
| y.....                       | N. P. R. R.....                    | 3,365        |
| Bridge, Jefferson River..... | Hayden.....                        | 4,063        |
| .....                        | N. P. R. R.....                    | 2,493        |
| k.....                       | N. P. Transcontinental Survey..... | 4,260        |
| .....                        | N. P. R. R.....                    | 4,290        |
| 's.....                      | De Lacy.....                       | 5,826        |
| 's Pillar.....               | N. P. R. R.....                    | 2,869        |
| ie Butte.....                | N. P. Transcontinental Survey..... | 6,970        |
| 's Pass.....                 | Pre. R. R. levels.....             | 6,538        |
| e.....                       | N. P. R. R.....                    | 2,777        |
| .....                        | N. P. R. R.....                    | 2,460        |
| y Station, on the bench..... | Pre. R. R. levels.....             | 4,720        |
| .....                        | N. P. R. R.....                    | 2,593        |
| ort, Signal Station.....     | U. S. Signal Office.....           | 3,470        |
| .....                        | De Lacy.....                       | 5,221        |
| .....                        | Mullan.....                        | 7,200        |
| sz Percé Pass.....           | Pacific R. R. Reports.....         | 8,000        |
| mountain.....                | Hayden.....                        | 10,880       |
| le.....                      | N. P. R. R.....                    | 4,188        |
| hill.....                    | U. & N. R. R.....                  | 6,199        |
| Butte,.....                  | N. P. Transcontinental Survey..... | 5,750        |
| .....                        | De Lacy.....                       | 5,217        |
| er.....                      | N. P. R. R.....                    | 3,570        |
| Pass.....                    | Pre. R. R. levels.....             | 7,079        |
| Station.....                 | De Lacy.....                       | 4,244        |
| .....                        | N. P. R. R.....                    | 2,240        |
| rttes, highest.....          | Pacific R. R. Reports.....         | 6,700        |
| id.....                      | N. P. R. R.....                    | 3,809        |
| reek.....                    | N. P. R. R.....                    | 2,375        |
| ake.....                     | N. P. Transcontinental Survey..... | 7,413        |
| .....                        | N. P. Transcontinental Survey..... | 4,540        |
| ms.....                      | Hayden.....                        | 7,223        |

| Station.                      | Authority.                    | Elevation.   |
|-------------------------------|-------------------------------|--------------|
|                               |                               | <i>Feet.</i> |
| U. N. Junction .....          | N. P. R. R. ....              | 4, 315       |
| Utica .....                   | N. P. Transcontinental Survey | 4, 420       |
| Virginia City .....           | Hayden .....                  | 5, 824       |
| Do .....                      | De Lacy .....                 | 5, 778       |
| Do .....                      | U. S. Signal Office .....     | 5, 480       |
| Ward's Peak .....             | Hayden .....                  | 10, 371      |
| Do .....                      | Hayden .....                  | 9, 156       |
| Do .....                      | timber line on .....          | 4 296        |
| Warm Springs Hotel .....      | Pre. R. R. levels .....       | 5, 269       |
| Watson's Stage Station .....  | Pre. R. R. levels .....       | 10, 342      |
| Wedge Mountain .....          | Hayden .....                  | 4, 493       |
| Whitehall Stage Station ..... | Pre. R. R. levels .....       | 6, 603       |
| Williams .....                | U. & N. R. R. ....            | 4, 760       |
| Wolf Butte .....              | N. P. Transcontinental Survey |              |

# NEBRASKA.

| Station.            | Authority.                 | Elevation.   |
|---------------------|----------------------------|--------------|
|                     |                            | <i>Feet.</i> |
| Adams .....         | A. & N. R. R. ....         | 1,250        |
| Albion .....        | O. N. & B. H. R. R. ....   | 1,756        |
| Alda .....          | U. P. R. R. ....           | 1,922        |
| Alexandria .....    | St. J. & D. C. R. R. ....  | 1,308        |
| Alkali .....        | U. P. R. R. ....           | 3,063        |
| Alma .....          | R. V. & B. & C. R. R. .... | 1,944        |
| Amboy .....         | B. & M. R. R. R. ....      | 1,693        |
| Antelope .....      | U. P. R. R. ....           | 4,712        |
| Arapaho .....       | R. V. & B. & C. R. R. .... | 2,177        |
| Arlington .....     | B. & M. R. R. R. ....      | 1,226        |
| Ashland .....       | B. & M. R. R. R. ....      | 1,101        |
| Auburn .....        | B. & M. R. R. R. ....      | 1,052        |
| Aurora .....        | B. & M. R. R. R. ....      | 1,803        |
| Ayr .....           | B. & M. R. R. R. ....      | 1,847        |
| Barton .....        | Toner .....                | 3,421        |
| Battlecreek .....   | S. C. & P. R. R. ....      | 1,602        |
| Beatrice .....      | B. & M. R. R. R. ....      | 1,261        |
| Belle Creek .....   | S. C. & P. R. R. ....      | 1,175        |
| Belle Wood .....    | A. & N. R. R. ....         | 1,451        |
| Belvidere .....     | St. J. & D. C. R. R. ....  | 1,501        |
| Benkleman .....     | R. V. & B. & C. R. R. .... | 2,975        |
| Bennett .....       | B. & M. R. R. R. ....      | 1,256        |
| Benton .....        | U. P. R. R. ....           | 1,404        |
| Berks .....         | B. & M. R. R. R. ....      | 1,428        |
| Big Spring .....    | U. P. R. R. ....           | 3,371        |
| Blair .....         | S. C. & P. R. R. ....      | 1,100        |
| Bloomington .....   | R. V. & B. & C. R. R. .... | 1,848        |
| Blue Hill .....     | B. & M. R. R. R. ....      | 1,978        |
| Bradshaw .....      | B. & M. R. R. R. ....      | 1,725        |
| Brady Island .....  | U. P. R. R. ....           | 2,657        |
| Brainard .....      | O. & R. V. R. R. ....      | 1,687        |
| Brownson .....      | Toner .....                | 4,200        |
| Brownsville .....   | B. & M. R. R. R. ....      | 894          |
| Buda .....          | R. V. & B. & C. R. R. .... | 1,377        |
| Burchard .....      | R. V. & B. & C. R. R. .... | 1,367        |
| Burnett .....       | S. C. & P. R. R. ....      | 1,691        |
| Cambridge .....     | R. V. & B. & C. R. R. .... | 2,262        |
| Caldwell .....      | B. & M. R. R. R. ....      | 1,275        |
| Calhoun, Fort ..... | Toner .....                | 1,327        |
| Carleton .....      | St. J. & D. C. R. R. ....  | 1,554        |
| Carns' .....        | R. V. & B. & C. R. R. .... | 1,998        |
| Cedar Creek .....   | B. & M. R. R. R. ....      | 1,028        |
| Central City .....  | B. & M. R. R. R. ....      | 1,708        |
| Chapman's .....     | U. P. R. R. ....           | 1,775        |
| Chappel .....       | .....                      | 5,702        |
| Cheney's .....      | B. & M. R. R. R. ....      | 1,435        |
| Chester .....       | R. V. & B. & C. R. R. .... | 1,621        |
| Clarke, Fort .....  | .....                      | 1,876        |
| Clark's .....       | U. P. R. R. ....           | 1,628        |
| Clear Creek .....   | O. & R. V. R. R. ....      | 1,185        |
| Coleraine .....     | Toner .....                | 1,518        |
| Columbus .....      | U. P. R. R. ....           | 1,453        |
| Cowles .....        | B. & M. R. R. R. ....      | 1,801        |
| Cozad .....         | U. P. R. R. ....           | 2,501        |
| Crete .....         | B. & M. R. R. R. ....      | 1,368        |
| Crowell .....       | S. C. & P. R. R. ....      | 1,285        |
| Culbertson .....    | R. V. & B. & C. R. R. .... | 2,572        |
| Dakota .....        | Toner .....                | 1,090        |



| Station.               | Authority.            | Elevation.   |
|------------------------|-----------------------|--------------|
|                        |                       | <i>Feet.</i> |
| Davenport .....        | St. J. & D. C. R. R.  | 1,660        |
| David City .....       | A. & N. R. R.         | 1,619        |
| Dawson .....           | A. & N. R. R.         | 950          |
| De Soto .....          | Toner                 | 1,100        |
| Denton .....           | B. & M. R. R. R.      | 1,247        |
| Dewitt .....           | B. & M. R. R. R.      | 1,299        |
| Dexter .....           | Toner                 | 3,000        |
| Diller .....           | R. V. & B. & C. R. R. | 1,349        |
| Dorchester .....       | B. & M. R. R. R.      | 1,501        |
| Dunbar .....           | B. & M. R. R. R.      | 1,051        |
| Duncan .....           | U. P. R. R.           | 1,500        |
| Eden .....             | St. J. & D. C. R. R.  | 1,729        |
| El Dorado .....        | Toner                 | 1,693        |
| Elk Creek .....        | A. & N. R. R.         | 1,072        |
| Elk Horn .....         | U. P. R. R.           | 1,165        |
| Elm Creek .....        | U. P. R. R.           | 2,273        |
| Emerald .....          | A. & N. R. R.         | 1,206        |
| Emerson .....          | Toner                 | 1,300        |
| Endicott .....         | R. V. & B. & C. R. R. | 1,291        |
| Exeter .....           | B. & M. R. R. R.      | 1,622        |
| Fairbury .....         | St. J. & D. C. R. R.  | 1,316        |
| Fairfield .....        | St. J. & D. C. R. R.  | 1,780        |
| Fairmont .....         | B. & M. R. R. R.      | 1,656        |
| Falls City .....       | A. & N. R. R.         | 904          |
| Firth .....            | A. & N. R. R.         | 1,319        |
| Fontenelle .....       | Smithsonian Inst.     | 1,000        |
| Franklin .....         | R. V. B. & C. R. R.   | 1,820        |
| Fremont .....          | U. P. R. R.           | 1,203        |
| Friendville .....      | B. & M. R. R. R.      | 1,573        |
| Gannett .....          | U. P. R. R.           | 2,752        |
| Garrison .....         | A. & N. R. R.         | 1,602        |
| Genoa .....            | O. N. & B. H. R. R.   | 1,584        |
| Georgetown .....       | St. J. & D. C. R. R.  | 1,844        |
| Germantown .....       | B. & M. R. R. R.      | 1,399        |
| Gibbon .....           | U. P. R. R.           | 2,067        |
| Gibraltar .....        | A. & N. R. R.         | 860          |
| Gilmore .....          | U. P. R. R.           | 998          |
| Glendale .....         | Smithsonian Inst.     | 1,300        |
| Grafton .....          | B. & M. R. R. R.      | 1,699        |
| Grand Island .....     | U. & P. R. R.         | 1,871        |
| Gratton, Fort .....    | Warren                | 8,325        |
| Greenwood .....        | B. & M. R. R. R.      | 1,141        |
| Guide Rock .....       | R. V. & B. & C. R. R. | 1,650        |
| Hampton .....          | B. & M. R. R. R.      | 1,770        |
| Harbine .....          | R. V. & B. & C. R. R. | 1,673        |
| Hardy .....            | R. V. & B. & C. R. R. | 1,512        |
| Harvard .....          | B. & M. R. R. R.      | 1,812        |
| Hastings .....         | B. & M. R. R. R.      | 1,947        |
| Heigler .....          | R. V. & B. & C. R. R. | 3,265        |
| Hickman .....          | A. & N. R. R.         | 1,247        |
| Hooper .....           | S. C. & P. R. R.      | 1,237        |
| Hubbell .....          | R. V. & B. & C. R. R. | 1,460        |
| Humboldt .....         | A. & N. R. R.         | 925          |
| Humphreys .....        | O. N. & B. H. R. R.   | 1,650        |
| Idaho .....            | St. J. & D. C. R. R.  | 2,003        |
| Inavale .....          | R. V. & B. & C. R. R. | 1,729        |
| Indianola .....        | R. V. & B. & C. R. R. | 2,390        |
| Inland .....           | B. & M. R. R. R.      | 1,868        |
| Ionia .....            | Smithsonian Inst.     | 3,000        |
| Jefferson .....        | St. J. & D. C. R. R.  | 2,079        |
| Johnson .....          | B. & M. R. R. R.      | 1,230        |
| Juniata .....          | B. & M. R. R. R.      | 2,054        |
| Karosha .....          | Smithsonian Inst.     | 1,050        |
| Kearney Junction ..... | U. P. R. R.           | 2,157        |

| Station.                             | Authority.                         | Elevation.   |
|--------------------------------------|------------------------------------|--------------|
|                                      |                                    | <i>Feet.</i> |
| w.....                               | U. P. R. R.....                    | 2,088        |
| d.....                               | S. C. & P. R. R.....               | 1,157        |
| m.....                               | Toner.....                         | 1,272        |
| .....                                | R. V. & B. & C. R. R.....          | 1,272        |
| .....                                | B. & M. R. R. R.....               | 1,155        |
| ood.....                             | Toner.....                         | 1,800        |
| Pole.....                            | U. P. R. R.....                    | 3,833        |
| reek.....                            | O. N. & B. H. R. R.....            | 1,500        |
| lle.....                             | B. & M. R. R. R.....               | 1,040        |
| .....                                | B. & M. R. R. R.....               | 2,076        |
| .....                                | R., V., B & C. R. R.....           | 2,511        |
| son.....                             | .....                              | 2,695        |
| n.....                               | O. N. & B. H. R. R.....            | 1,585        |
| n.....                               | B. & M. R. R. R.....               | 1,291        |
| tte.....                             | B. & M. R. R. R.....               | 1,825        |
| ll.....                              | U. P. R. R.....                    | 2,718        |
| .....                                | O. & R. V. R. R.....               | 1,218        |
| .....                                | R., V., B. & C. R. R.....          | 2,880        |
| .....                                | A. & N. R. R.....                  | 1,414        |
| .....                                | U. P. R. R.....                    | 1,078        |
| l, Camp.....                         | .....                              | 3,891        |
| .....                                | O. N. & B. H. R. R.....            | 1,595        |
| .....                                | R., V., B. & C. R. R.....          | 1,878        |
| ka City.....                         | B. & M. R. R. R.....               | 941          |
| a City.....                          | B. & M. R. R. R.....               | 885          |
| .....                                | B. & M. R. R. R.....               | 2,126        |
| rtle.....                            | Toner.....                         | 800          |
| .....                                | B. & M. R. R. R.....               | 1,151        |
| .....                                | .....                              | 2,920        |
| son.....                             | S. C. & P. R. R.....               | 1,211        |
| .....                                | S. C. & P. R. R.....               | 1,532        |
| Bend.....                            | U. P. R. R.....                    | 1,279        |
| Platte.....                          | U. P. R. R.....                    | 2,808        |
| ..... Signal Station.....            | U. S. Signal Office.....           | 2,841        |
| la.....                              | B. & M. R. R. R.....               | 1,086        |
| y.....                               | Smithsonian Ins.....               | 1,266        |
| ale.....                             | S. C. & P. R. R.....               | 1,722        |
| .....                                | R. V. & B. & C. R. R.....          | 1,281        |
| on's.....                            | U. P. R. R.....                    | 2,892        |
| la.....                              | U. P. R. R.....                    | 3,216        |
| ..... high water Missouri River..... | Mean result from R. R. levels..... | 967          |
| ..... low water Missouri River.....  | Mean result from R. R. levels..... | 956          |
| ..... passenger depot.....           | Mean result from R. R. levels..... | 1,039        |
| ..... Signal Station.....            | U. S. Signal Office.....           | 1,113        |
| olis.....                            | B. & M. R. R. R.....               | 974          |
| .....                                | O. & R. V. R. R.....               | 1,642        |
| n.....                               | U. P. R. R.....                    | 2,326        |
| .....                                | R. V. & B. & C. R. R.....          | 2,079        |
| ra.....                              | B. & M. R. R. R.....               | 1,151        |
| on.....                              | U. P. R. R.....                    | 1,005        |
| .....                                | R. V. & B. & C. R. R.....          | 3,099        |
| e.....                               | R. V. & B. & C. R. R.....          | 1,180        |
| .....                                | B. & M. R. R. R.....               | 903          |
| .....                                | S. C. & P. R. R.....               | 1,423        |
| r Grove.....                         | Smithsonian Inst.....              | 1,400        |
| Center.....                          | O. M. & B. & H. R. R.....          | 1,537        |
| nouth.....                           | B. & M. R. R. R.....               | 983          |
| nt Dale.....                         | A. & N. R. R.....                  | 1,311        |
| reek.....                            | U. P. R. R.....                    | 2,394        |
| .....                                | U. P. R. R.....                    | 4,386        |
| n.....                               | A. & N. R. R.....                  | 885          |
| m.....                               | B. & M. R. R. R.....               | 1,378        |
| loud.....                            | R. V. & B. & C. R. R.....          | 1,690        |
| lican.....                           | R. V. & B. & C. R. R.....          | 1,944        |

| Station.            | Authority.                    | Elevation.   |
|---------------------|-------------------------------|--------------|
|                     |                               | <i>Feet.</i> |
| Reveitar .....      | R. V. & B. & C. R. R. ....    | 1,768        |
| Reynolds .....      | R. V. & B. & C. R. R. ....    | 1,389        |
| Richland .....      | Toner .....                   | 1,350        |
| Risings .....       | O. & R. V. R. R. ....         | 1,597        |
| Roca .....          | A. & N. R. R. ....            | 1,219        |
| Rock Bluffs .....   | Smithsonian Inst .....        | 1,100        |
| Rodgers .....       | Toner .....                   | 1,359        |
| Ruby .....          | A. & N. R. R. ....            | 1,425        |
| Saint Edward .....  | O. N. & B. H. R. R. ....      | 1,686        |
| Salem .....         | A. & N. R. R. ....            | 915          |
| Saltillo .....      | A. & N. R. R. ....            | 1,178        |
| Schuyler .....      | U. P. R. R. ....              | 1,356        |
| Scribner .....      | S. C. & P. R. R. ....         | 1,266        |
| Seward .....        | B. & M. R. R. R. ....         | 1,445        |
| Shelton .....       | U. P. R. R. ....              | 2,027        |
| Sidney .....        | U. P. R. R. ....              | 4,095        |
| Silver Creek .....  | U. P. R. R. ....              | 1,555        |
| South Bend .....    | B. & M. R. R. R. ....         | 1,051        |
| Stanton .....       | S. C. & P. ....               | 1,486        |
| Staplehurst .....   | A. & N. R. R. ....            | 1,482        |
| Steele City .....   | St. J. & D. C. R. R. ....     | 1,269        |
| Sterling .....      | A. & N. R. R. ....            | 1,185        |
| Stratton .....      | R. V. & B. & C. R. R. R. .... | 2,800        |
| Stromsburgh .....   | O. & R. V. R. R. ....         | 1,636        |
| Superior .....      | R. V. & B. & C. R. R. ....    | 1,574        |
| Sutton .....        | B. & M. R. R. R. ....         | 1,699        |
| Syracuse .....      | B. & M. R. R. R. ....         | 1,056        |
| Table Rock .....    | A. & N. R. R. ....            | 1,028        |
| Tamora .....        | B. & M. R. R. R. ....         | 1,559        |
| Tecumseh .....      | B. & M. R. R. R. ....         | 1,113        |
| Trenton .....       | R. V. & B. & C. R. R. ....    | 2,690        |
| Ulysses .....       | A. & N. R. R. ....            | 1,594        |
| Utica .....         | B. & M. R. R. R. ....         | 1,589        |
| Valley .....        | U. P. R. R. ....              | 1,149        |
| Valparaiso .....    | O. & R. V. R. R. ....         | 1,316        |
| Waco .....          | B. & M. R. R. R. ....         | 1,627        |
| Wahoo .....         | O. & R. V. R. R. ....         | 1,183        |
| Washington .....    | Toner .....                   | 1,025        |
| Waverly .....       | B. & M. R. R. R. ....         | 1,136        |
| Weston .....        | O. & R. V. R. R. ....         | 1,261        |
| West Point .....    | S. C. & P. R. R. ....         | 1,396        |
| Wilber .....        | B. & M. R. R. R. ....         | 1,339        |
| Willow Island ..... | U. F. R. R. ....              | 2,529        |
| Wisner .....        | S. C. & P. R. R. ....         | 1,393        |
| Woodlawn .....      | B. & M. R. R. R. ....         | 1,186        |
| Wood River .....    | U. P. R. R. ....              | 1,996        |
| Wymore .....        | B. & M. R. R. R. ....         | 1,232        |
| York .....          | B. & M. R. R. R. ....         | 1,642        |

# NEVADA.

| Station.                                   | Authority.                 | Elevation.   |
|--------------------------------------------|----------------------------|--------------|
|                                            |                            | <i>Feet.</i> |
| Agate Pass.....                            | Pacific R. R. Reports..... | 7,615        |
| Ahle's Ranch.....                          | Wheeler.....               | 5,990        |
| Airy, Mount.....                           | Wheeler.....               | 6,787        |
| Albion Peak.....                           | King.....                  | 8,391        |
| Allen's Springs.....                       | Wheeler.....               | 4,051        |
| Alpha.....                                 | E. & P. R. R.....          | 5,911        |
| American Flat Peak.....                    | Wheeler.....               | 6,659        |
| Anderson's Ranch.....                      | Wheeler.....               | 4,041        |
| Antelope Spring.....                       | Wheeler.....               | 7,201        |
| Do.....                                    | Wheeler.....               | 6,445        |
| Antelope Valley.....                       | Simpson.....               | { 5,633      |
| Antler Peak.....                           | King.....                  | { to 5,690   |
| Antoine's Ranch.....                       | Wheeler.....               | 8,433        |
| Argenta.....                               | C. P. R. R.....            | 6,517        |
| Aurora.....                                | Williamson.....            | 4,548        |
| Austin.....                                | Wheeler.....               | 7,441        |
| Do.....                                    | Williamson.....            | 6,594        |
| Bacon Mill Point.....                      | Wheeler.....               | 6,451        |
| Baltimore Mine.....                        | Wheeler.....               | 5,327        |
| Barkley Spring.....                        | Wheeler.....               | 5,729        |
| Basalt Peak.....                           | Wheeler.....               | 5,906        |
| Battle Mountain.....                       | Wheeler.....               | 6,599        |
| Belmont.....                               | C. P. R. R.....            | 4,511        |
| Beowawe.....                               | Wheeler.....               | 8,092        |
| Bergin Head.....                           | C. P. R. R.....            | 4,695        |
| Big Creek Pass.....                        | Powell.....                | 7,570        |
| Bill Williams' Ranch.....                  | King.....                  | 8,922        |
| Birchins, Mount.....                       | Wheeler.....               | 3,500        |
| Birchin's Ranch, Reese River Valley.....   | Wheeler.....               | 10,345       |
| Bishop.....                                | Toner.....                 | 5,743        |
| Black Rock Valley.....                     | Hayden.....                | 5,423        |
| Bonneville, Mount.....                     | King.....                  | 4,900        |
| Bonpland, Mount.....                       | King.....                  | 11,200       |
| Brown Knob Peak.....                       | Wheeler.....               | 11,321       |
| Brown's.....                               | Wheeler.....               | 6,202        |
| Buckeye Mine.....                          | C. & P. R. R.....          | 3,929        |
| Buckland's Ranch, Carson River Valley..... | Wheeler.....               | 5,221        |
| Buell Valley.....                          | Wheeler.....               | 4,151        |
| Buffalo Peak.....                          | Simpson.....               | 6,000        |
| Buffalo Spring.....                        | King.....                  | 8,387        |
| Bullion City.....                          | Wheeler.....               | 4,076        |
| Bull Run Mountain.....                     | Wheeler.....               | 6,386        |
| Bunker Hill Peak.....                      | Wheeler.....               | 9,040        |
| Bunker's Peak.....                         | Wheeler.....               | 11,405       |
| Bunnellsburgh.....                         | Powell.....                | 6,780        |
| Butterfield Spring.....                    | Wheeler.....               | 4,278        |
| Callville.....                             | Wheeler.....               | 5,324        |
| Campbell's Spring.....                     | Wheeler.....               | 945          |
| Camp Rock.....                             | Wheeler.....               | 7,366        |
| Cane Spring.....                           | Wheeler.....               | 5,628        |
| Carico Peak.....                           | Powell.....                | 2,050        |
| Carlin.....                                | King.....                  | 8,035        |
| Do.....                                    | Wheeler.....               | 4,849        |
| Carling Peak.....                          | C. P. R. R.....            | 4,897        |
| Caroline Point.....                        | King.....                  | 7,754        |
| Carson City.....                           | Powell.....                | 7,330        |
| Do.....                                    | C. P. R. R.....            | 4,630        |
|                                            | Wheeler.....               | 4,700        |

| Station.                               | Authority.                  | Elevation.   |
|----------------------------------------|-----------------------------|--------------|
|                                        |                             | <i>Feet.</i> |
| Carson City, Friends' Observatory..... | Wheeler .....               | 4,660        |
| Carson Hot Springs.....                | Wheeler .....               | 4,592        |
| Carson Lake.....                       | Wheeler .....               | 3,883        |
| Do.....                                | Pacific R. R. Reports ..... | 3,840        |
| Cave Valley.....                       | Wheeler .....               | 6,464        |
| Cedar Mountains.....                   | King .....                  | 6,500        |
| Cedar Valley.....                      | Wheeler .....               | 7,073        |
| Cerro Gordo Peak.....                  | Wheeler .....               | 9,432        |
| Chalk Well.....                        | Wheeler .....               | 7,604        |
| Chapman's Ranch.....                   | Wheeler .....               | 4,932        |
| Charcoal Mountain.....                 | Powell .....                | 7,290        |
| Charleston Peak.....                   | Petermann .....             | 10,874       |
| Chataya Peak.....                      | King .....                  | 7,766        |
| Cherry Valley.....                     | Wheeler .....               | 7,473        |
| Chinatown.....                         | Simpson .....               | 4,360        |
| Chollar Potosi Mining Co's Office..... | Wheeler .....               | 6,242        |
| Churchill Butte.....                   | Wheeler .....               | 6,009        |
| Churchill, Fort.....                   | Med. Dept. U. S. A.....     | 4,284        |
| Do.....                                | Williamson .....            | 4,319        |
| Clark's.....                           | C. P. R. R.....             | 4,263        |
| Clifton.....                           | .....                       | 6,339        |
| Clover Valley settlement.....          | Powell .....                | 5,300        |
| Do.....                                | Wheeler .....               | 4,908        |
| Cluro.....                             | Toner .....                 | 4,786        |
| Cold Spring.....                       | Wheeler .....               | 6,173        |
| Cold Springs.....                      | Wheeler .....               | 5,418        |
| Cold Springs.....                      | Wheeler .....               | 4,200        |
| Como Peak.....                         | Wheeler .....               | 9,017        |
| Cortez Peak.....                       | King .....                  | 8,363        |
| Cory, Mount.....                       | Wheeler .....               | 11,396       |
| Cottage, Camp.....                     | Wheeler .....               | 6,437        |
| Cottonwood Spring.....                 | Wheeler .....               | 3,450        |
| Cowles Peak.....                       | Wheeler .....               | 9,980        |
| Cox's Station.....                     | Wheeler .....               | 4,379        |
| Coyote.....                            | .....                       | 2,440        |
| Coyote Spring.....                     | Wheeler .....               | 3,674        |
| Crescent.....                          | Wheeler .....               | 5,438        |
| Crescent Mill.....                     | Wheeler .....               | 6,100        |
| Crosman Valley.....                    | Simpson .....               | 4,814        |
| Crosman's Spring.....                  | Wheeler .....               | 4,391        |
| Crystal Spring.....                    | Wheeler .....               | 5,782        |
| Cumberland.....                        | King .....                  | 5,674        |
| Curtis, Mount.....                     | Powell .....                | 9,000        |
| Custer Springs, Steptoe Valley.....    | King .....                  | 5,843        |
| Dalton Peak.....                       | King .....                  | 9,232        |
| Darby Mine.....                        | Wheeler .....               | 4,886        |
| Davidson, Mount.....                   | Wheeler .....               | 7,941        |
| Do.....                                | King .....                  | 7,827        |
| Davies, Mount.....                     | Wheeler .....               | 11,756       |
| Dayton.....                            | Wheeler .....               | 4,369        |
| Dead Horse Well.....                   | Wheeler .....               | 4,117        |
| Deep Hollow Station.....               | Wheeler .....               | 5,244        |
| Deeth.....                             | C. P. R. R.....             | 5,340        |
| Desatoya Peak.....                     | Wheeler .....               | 9,921        |
| Desert Wells.....                      | Wheeler .....               | 4,693        |
| Deyeringham's Ranch.....               | Wheeler .....               | 6,497        |
| Diamond.....                           | Eureka & P. R. R.....       | 5,941        |
| Diamond Valley.....                    | King .....                  | 5,560        |
| Disappointment Spring.....             | Wheeler .....               | 4,836        |
| Division Peak.....                     | Wheeler .....               | 8,566        |
| Dodge Valley.....                      | Simpson .....               | 5,486        |
| Duck Valley.....                       | Wheeler .....               | 6,066        |
|                                        |                             | } to 6,929   |

| Station.                       | Authority.                 | Elevation.   |
|--------------------------------|----------------------------|--------------|
|                                |                            | <i>Feet.</i> |
| er's Ranch.....                | Wheeler.....               | 4,571        |
| anch.....                      | Wheeler.....               | 6,037        |
| alley.....                     | Simpson.....               | 4,587        |
| alley settlement.....          | Powell.....                | 5,480        |
| te.....                        | Wheeler.....               | 5,291        |
| stice Hill.....                | Wheeler.....               | 5,861        |
| ange Pass.....                 | Wheeler.....               | 7,546        |
| e, Mount.....                  | Powell.....                | 7,692        |
| Ranch.....                     | Wheeler.....               | 6,123        |
| .....                          | C. P. R. R.....            | 5,063        |
| .....                          | Wheeler.....               | 5,148        |
| th.....                        | Wheeler.....               | 6,871        |
| it Pass Peak.....              | Wheeler.....               | 7,876        |
| it Peak.....                   | Wheeler.....               | 8,509        |
| Mount.....                     | King.....                  | 6,546        |
| .....                          | Wheeler.....               | 6,439        |
| City.....                      | Wheeler.....               | 4,593        |
| solidated Mine.....            | Wheeler.....               | 5,288        |
| Peak.....                      | King.....                  | 7,725        |
| Peak.....                      | King.....                  | 7,548        |
| .....                          | Wheeler.....               | 5,906        |
| .....                          | Enreka & P. R. R.....      | 6,371        |
| Mine.....                      | Wheeler.....               | 5,978        |
| r Peak.....                    | Wheeler.....               | 8,412        |
| do.....                        | King.....                  | 8,199        |
| ke.....                        | Wheeler.....               | 4,745        |
| .....                          | Wheeler.....               | 6,866        |
| ass.....                       | King.....                  | 8,028        |
| n Lake.....                    | Pacific R. R. Reports..... | 6,200        |
| n Valley.....                  | Pacific R. R. Reports..... | 6,248        |
| wn.....                        | Wheeler.....               | 5,054        |
| s Peak.....                    | Wheeler.....               | 10,779       |
| .....                          | Wheeler.....               | 5,650        |
| untain.....                    | Petermann.....             | 6,200        |
| anch.....                      | Wheeler.....               | 4,154        |
| Peak.....                      | King.....                  | 10,994       |
| do.....                        | Wheeler.....               | 11,077       |
| .....                          | Simpson.....               | 4,824        |
| .....                          | Wheeler.....               | 4,801        |
| Ranch.....                     | Wheeler.....               | 4,352        |
| na Post, near Succor Mine..... | Wheeler.....               | 5,452        |
| Crest.....                     | Powell.....                | 11,000       |
| ok.....                        | Wheeler.....               | 6,282        |
| .....                          | Wheeler.....               | 4,453        |
| Peak.....                      | King.....                  | 11,237       |
| ll Mine.....                   | Wheeler.....               | 6,374        |
| .....                          | C. P. R. R.....            | 4,385        |
| Lake.....                      | Pacific R. R. Reports..... | 5,952        |
| Pass.....                      | U. P. R. R. surveys.....   | 6,065        |
| Peak.....                      | King.....                  | 10,491       |
| Peak.....                      | Wheeler.....               | 10,964       |
| Peak.....                      | King.....                  | 8,307        |
| Peak.....                      | Wheeler.....               | 8,990        |
| fount.....                     | Wheeler.....               | 9,965        |
| ine Spring.....                | Powell.....                | 1,930        |
| alley.....                     | Hayden.....                | 4,300        |
| Ranch.....                     | Wheeler.....               | 4,187        |
| alley.....                     | Hayden.....                | 5,600        |
| alley.....                     | Pacific R. R. Reports..... | 5,368        |
| ry Springs.....                | Powell.....                | 2,620        |
| ak.....                        | King.....                  | 11,298       |
| y House.....                   | Wheeler.....               | 5,006        |
| .....                          | C. P. R. R.....            | 5,230        |

| Station.                                  | Authority.                   | Ele |
|-------------------------------------------|------------------------------|-----|
| Halleck Camp .....                        | King .....                   |     |
| Do. do. ....                              | Smithsonian Inst .....       |     |
| Do. do. ....                              | Wheeler .....                |     |
| Hamilton .....                            | Wheeler .....                |     |
| Hastings Pass .....                       | U. P. R. R. surveys .....    |     |
| Do. ....                                  | Simpson .....                |     |
| Hawthorne .....                           | Carson & Colorado R. R. .... |     |
| Hay Ranch .....                           | Eureka & P. R. R. ....       |     |
| Hiko .....                                | Wheeler .....                |     |
| Hill and Gaines Ranch .....               | Wheeler .....                |     |
| Home .....                                | Wheeler .....                |     |
| Home Station .....                        | Wheeler .....                |     |
| Honey Lake .....                          | .....                        |     |
| Hot Springs .....                         | C. P. R. R. ....             |     |
| Do. ....                                  | Wheeler .....                |     |
| Hot Springs Peak .....                    | Wheeler .....                |     |
| Hot Springs, Walker's River .....         | .....                        |     |
| Houstan's Wells .....                     | Wheeler .....                |     |
| Humboldt .....                            | C. P. R. R. ....             |     |
| Humboldt River Basin .....                | .....                        |     |
| Huntington Valley .....                   | Wheeler .....                | }   |
| Independence .....                        | C. P. R. R. ....             |     |
| Indian Agency, Walker River .....         | Wheeler .....                |     |
| Indian Pass .....                         | King .....                   |     |
| Indian Spring .....                       | Wheeler .....                |     |
| Inyo Peak .....                           | King .....                   |     |
| Ione .....                                | Wheeler .....                |     |
| Iron Point .....                          | C. P. R. R. ....             |     |
| Ivanpah .....                             | Wheeler .....                |     |
| Ives Pass .....                           | King .....                   |     |
| Janesville .....                          | Wheeler .....                |     |
| Jones' Mills Ranch .....                  | Wheeler .....                |     |
| Kanan's Ranch .....                       | Powell .....                 |     |
| Kate, Mount .....                         | King .....                   |     |
| Kingston .....                            | .....                        |     |
| King's Valley .....                       | Hayden .....                 |     |
| Knickerbocker Mine .....                  | Wheeler .....                |     |
| Kobeh Valley .....                        | Simpson .....                | }   |
| Ladrones, Mount .....                     | Wheeler .....                |     |
| Lassen's Meadows .....                    | Pacific R. R. Reports .....  |     |
| Las Vegas .....                           | Wheeler .....                |     |
| Do. ....                                  | Wheeler .....                |     |
| Lee's Mill, Mason Valley .....            | Wheeler .....                |     |
| Locust Spring .....                       | Wheeler .....                |     |
| Lodi .....                                | Wheeler .....                |     |
| Lodi Peak .....                           | Wheeler .....                |     |
| Long Valley .....                         | Wheeler .....                |     |
| Do. ....                                  | Simpson .....                |     |
| Lovelocks .....                           | C. P. R. R. ....             |     |
| Lyon, Mount .....                         | Wheeler .....                |     |
| Lyonsville .....                          | Wheeler .....                |     |
| McCabe's Pass .....                       | U. P. R. R. Surveys .....    |     |
| McClellan Mountain .....                  | Wheeler .....                |     |
| McClellan's Cove .....                    | Wheeler .....                |     |
| McDermott, Camp .....                     | Med. Dept., U. S. A. ....    |     |
| McGarry, Camp .....                       | Med. Dept., U. S. A. ....    |     |
| McKenney's, on Lake Tahoe .....           | Wheeler .....                |     |
| McKinney's Pass .....                     | King .....                   |     |
| McMahon's Ranch, Reese River Valley ..... | Wheeler .....                |     |
| Maggie Peak .....                         | King .....                   |     |
| Mahogany, Mount .....                     | Wheeler .....                |     |
| Mahogany Peak .....                       | King .....                   |     |

| Station.                                              | Authority.                 | Elevation.   |
|-------------------------------------------------------|----------------------------|--------------|
|                                                       |                            | <i>Feet.</i> |
| Manzano, Mount.....                                   | Wheeler.....               | 10,086       |
| Marlett's Ranch.....                                  | Wheeler.....               | 8,074        |
| Mason's Ranch.....                                    | Wheeler.....               | 4,348        |
| Matinango Peak.....                                   | Wheeler.....               | 8,845        |
| Meadow Valley.....                                    | Powell.....                | 4,400        |
| Mill City.....                                        | C. P. R. R.....            | { to 4,800   |
| Miller's Spring.....                                  | Powell.....                | 4,226        |
| Millford.....                                         | Wheeler.....               | 6,220        |
| Mineral.....                                          | Eureka & P. R. R.....      | 4,204        |
| Mineral Pass.....                                     | Wheeler.....               | 5,443        |
| Moleen.....                                           | C. P. R. R.....            | 6,969        |
| Monte Cristo Mill.....                                | Wheeler.....               | 4,982        |
| Montello.....                                         | C. P. R. R.....            | 7,596        |
| Monument Hill.....                                    | Wheeler.....               | 5,010        |
| Moore.....                                            | C. P. R. R.....            | 6,734        |
| Moore Campbell's Ranch.....                           | Wheeler.....               | 6,166        |
| Morey.....                                            | Wheeler.....               | 6,267        |
| Mosca, Mount.....                                     | Wheeler.....               | 7,384        |
| Mountain Spring.....                                  | Wheeler.....               | 9,723        |
| Mud Lake.....                                         | Pacific R. R. Reports..... | 5,501        |
| Mud Lakes Valley.....                                 | King.....                  | 4,079        |
| Do.....                                               | Pacific R. R. Reports..... | 3,862        |
|                                                       |                            | { to 4,000   |
| Mud Meadows.....                                      | Wheeler.....               | 4,000        |
| Mud Spring.....                                       | Wheeler.....               | 4,318        |
| Nannie's Peak.....                                    | King.....                  | 4,900        |
| Nelson's Station.....                                 | Wheeler.....               | 9,046        |
| Nevada City.....                                      | Toner.....                 | 4,245        |
| Newton's Ranch, near Honey Lake.....                  | Wheeler.....               | 6,205        |
| North Granite Peak.....                               | Wheeler.....               | 4,079        |
| North Pass.....                                       | C. P. R. R. Surveys.....   | 8,363        |
| Occidental Mills, Virginia City.....                  | Wheeler.....               | 5,964        |
| Olcott, Mount.....                                    | Wheeler.....               | 5,480        |
| Old Kentucky Ranch, Sutro Tunnel Road.....            | Wheeler.....               | 7,974        |
| O'Neill's Ranch.....                                  | Wheeler.....               | 5,684        |
| Ophir Water Tank.....                                 | Wheeler.....               | 5,581        |
| Oreana.....                                           | C. P. R. R.....            | 6,509        |
| Omnaby Peak.....                                      | King.....                  | 4,181        |
| Osba, Mount.....                                      | Wheeler.....               | 8,388        |
| Osino.....                                            |                            | 10,023       |
| Owyhee.....                                           | Wheeler.....               | 5,100        |
| Oxford Peak.....                                      | King.....                  | 5,392        |
| Overton.....                                          | Powell.....                | 7,556        |
| Pah-guhn-pah-ghun Spring.....                         | Wheeler.....               | 1,360        |
| Pahranaugut Lake.....                                 |                            | 2,282        |
| Pahrump Valley.....                                   | Simpson.....               | 3,400        |
| Pah-Ute Peak.....                                     | Wheeler.....               | { to 5,700   |
| Palisade, junction with Eureka and Palisade R. R..... |                            | to 6,000     |
| Panacca.....                                          | C. P. R. R.....            | 8,618        |
| Do.....                                               | Powell.....                | 4,821        |
| Panacca Head.....                                     | Wheeler.....               | 4,770        |
| Paradise Peak.....                                    | Powell.....                | 4,718        |
| Paradise Valley.....                                  | Wheeler.....               | 7,450        |
| Park Peak.....                                        | Hayden.....                | 8,662        |
| Patterson's Ranch.....                                | Wheeler.....               | 4,500        |
| Peavine Mount.....                                    | Wheeler.....               | 8,683        |
| Peavine Peak.....                                     | King.....                  | 5,213        |
| Peavine Ranch.....                                    | Wheeler.....               | 6,217        |
| Pedernal, Mount.....                                  | Wheeler.....               | 8,275        |
| Peko.....                                             | Wheeler.....               | 4,952        |
| Do.....                                               | Wheeler.....               | 7,580        |
|                                                       | C. P. R. R.....            | 5,204        |
|                                                       | Wheeler.....               | 5,180        |



| Station.                                           | Authority.                         | Elev. |
|----------------------------------------------------|------------------------------------|-------|
| Peko Peak .....                                    | King .....                         |       |
| Pennoyer Spring .....                              | Wheeler .....                      |       |
| Pequot .....                                       | C. P. R. R. .....                  |       |
| Pequot Pass .....                                  | U. P. R. R. Surveys .....          |       |
| Do .....                                           | C. P. R. R. Surveys .....          |       |
| Peterson's Ranch .....                             | Wheeler .....                      |       |
| Petona Mine .....                                  | Wheeler .....                      |       |
| Phelps Valley .....                                | Simpson .....                      |       |
| Piermont .....                                     | Wheeler .....                      |       |
| Pilot Knob .....                                   | Wheeler .....                      |       |
| Piñon Pass .....                                   | King .....                         |       |
| Pinto, Mount .....                                 | Wheeler .....                      |       |
| Do .....                                           | King .....                         |       |
| Pinto Spring .....                                 | Wheeler .....                      |       |
| Ploche .....                                       | Wheeler .....                      |       |
| Do .....                                           | Powell .....                       |       |
| Do..Signal Station .....                           | U. S. Signal Office .....          |       |
| Placer, Mount .....                                | Wheeler .....                      |       |
| Point of Rocks Peak .....                          | King .....                         |       |
| Poston, Mount .....                                | Wheeler .....                      |       |
| Proctor's Ranch, Truckee River .....               | Wheeler .....                      |       |
| Prometheus Mountain .....                          | King .....                         |       |
| Do .....                                           | Wheeler .....                      |       |
| Pueblo Valley .....                                | Hayden .....                       |       |
| Pyramid Lake .....                                 | Pacific Railroad Reports .....     |       |
| Pyramid Lake Indian Agency .....                   | Wheeler .....                      |       |
| Quartz Mountain .....                              | Wheeler .....                      |       |
| Quinn's River Valley .....                         | Hayden .....                       |       |
| Quinn Cañon .....                                  | Wheeler .....                      |       |
| Quinn's River Valley .....                         | Hayden .....                       |       |
| Rabbit Hole Spring .....                           | King .....                         |       |
| Ragtown .....                                      | King .....                         |       |
| Do .....                                           | Wheeler .....                      |       |
| Railroad Peak .....                                | King .....                         |       |
| Do.....(Black Rock) .....                          | Wheeler .....                      |       |
| Ramsell City .....                                 | Wheeler .....                      |       |
| Raspberry .....                                    | C. P. R. R. .....                  |       |
| Rattlesnake Hill .....                             | Wheeler .....                      |       |
| Rattlesnake Spring .....                           | Wheeler .....                      |       |
| Raven's Nest Peak .....                            | King .....                         |       |
| Raw Mountain .....                                 | Wheeler .....                      |       |
| Red Dome Pass .....                                | U. P. R. R. Surveys .....          |       |
| Do .....                                           | C. P. R. R. Surveys .....          |       |
| Reese River Valley .....                           | Simpson .....                      |       |
| Reno .....                                         | Wheeler .....                      |       |
| Do..Junction Virginia City and Truckee R. R. ..... | C. P. R. R. .....                  |       |
| Robert's Peak .....                                | King .....                         |       |
| Rock Island Mine .....                             | Wheeler .....                      |       |
| Rose Creek .....                                   | C. P. R. R. .....                  |       |
| Rose Mountain .....                                | King .....                         |       |
| Rose Mountain .....                                | King .....                         |       |
| Rose Mountain .....                                | Wheeler .....                      |       |
| Rose Valley .....                                  | Wheeler .....                      |       |
| Rose Valley Settlement .....                       | Powell .....                       |       |
| Ruby, Camp .....                                   | Wheeler .....                      |       |
| Do .....                                           | Medical Department, U. S. A. ..... |       |
| Ruby Valley .....                                  | Simpson .....                      |       |
| Rye Patch .....                                    | C. P. R. R. .....                  |       |
| Sacramento .....                                   |                                    |       |
| Saint Clair .....                                  | Wheeler .....                      |       |
| Saint Joseph .....                                 | Powell .....                       |       |
| Saint Thomas .....                                 | Powell .....                       |       |

| Station.                               | Authority.                | Elevation.   |
|----------------------------------------|---------------------------|--------------|
|                                        |                           | <i>Feet.</i> |
| Saint Thomas .....                     | Wheeler .....             | 1,600        |
| Salt Valley .....                      | Hayden .....              | 4,200        |
| San Antonio .....                      | Wheeler .....             | 5,281        |
| Sand Springs .....                     | Wheeler .....             | 3,928        |
| San Juan .....                         | .....                     | 8,075        |
| San Juan Peak .....                    | King .....                | 10,942       |
| Saratoga Springs .....                 | Wheeler .....             | 264          |
| Schafer Springs .....                  | Wheeler .....             | 6,186        |
| Schaffer's Peak .....                  | Wheeler .....             | 6,865        |
| Schaffer's Station .....               | Wheeler .....             | 4,026        |
| Schenonsky's Pass .....                | U. P. R. R. Surveys ..... | 6,355        |
| Schmidtlein's Ranch .....              | Wheeler .....             | 6,220        |
| Seetoya Peak .....                     | King .....                | 9,545        |
| Seller's Ranch, near Reno .....        | Wheeler .....             | 4,439        |
| Shell Creek Range (highest peak) ..... | Wheeler .....             | 11,200       |
| Do .....                               | Wheeler .....             | 8,000        |
| Shermantown .....                      | .....                     | 4,445        |
| Shoshone .....                         | C. P. R. R. .....         | 4,636        |
| Shoshone Peak .....                    | King .....                | 9,760        |
| Shoshone Wells .....                   | King .....                | 5,796        |
| Signal Peak .....                      | King .....                | 9,387        |
| Silver Age Station .....               | Wheeler .....             | 6,014        |
| Silver City, old foundry .....         | Wheeler .....             | 4,940        |
| Silver Peak Mines .....                | Wheeler .....             | 4,257        |
| Simmond's Springs .....                | .....                     | 5,000        |
| Sinkwater Peak .....                   | Wheeler .....             | 7,511        |
| Smoke Creek Depot .....                | .....                     | 4,570        |
| Spanish Peak .....                     | King .....                | 7,463        |
| Do .....                               | Wheeler .....             | 7,402        |
| Spanish Springs .....                  | Wheeler .....             | 4,469        |
| Spring Valley .....                    | Wheeler .....             | 6,102        |
| Spring Valley Pass .....               | King .....                | 6,251        |
| Spring Valley Spring .....             | Wheeler .....             | 7,768        |
| Spruce Mountain .....                  | King .....                | 11,041       |
| Star City .....                        | Toner .....               | 7,500        |
| Star Peak .....                        | King .....                | 9,925        |
| State Peak .....                       | Wheeler .....             | 7,115        |
| Steamboat Springs .....                | Wheeler .....             | 4,595        |
| Steptoe Valley .....                   | Wheeler .....             | 5,730        |
| Do .....                               | Simpson .....             | 5,800        |
| Sterling Mill .....                    | Wheeler .....             | 6,200        |
| Stone House .....                      | .....                     | 6,818        |
| Stone's Cabin .....                    | C. P. R. R. .....         | 4,422        |
| Stone's Ferry .....                    | Wheeler .....             | 6,390        |
| Do .....                               | Powell .....              | 695          |
| Stony Peak .....                       | Wheeler .....             | 1,108        |
| Stamp's Ranch .....                    | King .....                | 6,650        |
| Sue's Peak .....                       | Wheeler .....             | 4,749        |
| Sugar Loaf Mountain .....              | King .....                | 8,477        |
| Sulphur Springs .....                  | King .....                | 6,164        |
| Sulphur Spring Peak .....              | Wheeler .....             | 3,972        |
| Summit Spring .....                    | Powell .....              | 7,010        |
| Summit Springs .....                   | Powell .....              | 6,327        |
| Superior G. & S. mine .....            | Wheeler .....             | 6,415        |
| Susanville .....                       | Wheeler .....             | 4,218        |
| Sutro Springs .....                    | Wheeler .....             | 5,366        |
| Taragga Peak .....                     | King .....                | 8,751        |
| Do .....                               | Wheeler .....             | 8,772        |
| Taylor's Ranch .....                   | Wheeler .....             | 4,720        |
| Tecolote, Mount. ....                  | Wheeler .....             | 7,254        |
| Tecoma .....                           | C. P. R. R. .....         | 4,812        |
| Telescope Peak .....                   | Wheeler .....             | 10,938       |
| Tenabo Peak .....                      | King .....                | 9,240        |
| Thousand Springs Valley .....          | Hayden .....              | 5,950        |

| Station.                                | Authority.                    | Elev. |
|-----------------------------------------|-------------------------------|-------|
| Ti-ba-ba Springs.....                   | Wheeler.....                  |       |
| Tibbie Mountain.....                    | Wheeler.....                  |       |
| Timpahute Mountain.....                 | Wheeler.....                  |       |
| Timpahute Spring.....                   | Wheeler.....                  |       |
| Tinnah-nah Springs.....                 | Wheeler.....                  |       |
| Tissapook Spring.....                   | Wheeler.....                  |       |
| Titilla.....                            | Wheeler.....                  |       |
| Toano.....                              | C. P. R. R.....               |       |
| Todhunter's Camp, Long Valley.....      | Wheeler.....                  |       |
| To-ha-cum Peak.....                     | Wheeler.....                  |       |
| Toyabe Peak.....                        | Wheeler.....                  |       |
| Trinity Peak.....                       | King.....                     |       |
| Trojan Mine.....                        | Wheeler.....                  |       |
| Truckee Valley.....                     | Hayden.....                   | }     |
| Tulasco.....                            |                               |       |
| Tule Spring.....                        |                               |       |
| Tutib, Mount.....                       | Wheeler.....                  |       |
| Twin Lakes.....                         | Wheeler.....                  |       |
| Uiyabi Pass.....                        | P. R. R. Reports.....         |       |
| Ungoweah Mountains.....                 | Simpson.....                  | }     |
| Union.....                              | Toner.....                    |       |
| Upper Caledonia Mine.....               | Wheeler.....                  |       |
| Utah Mine.....                          | Wheeler.....                  |       |
| Vaughan's Ranch.....                    | Wheeler.....                  |       |
| Verdi.....                              | C. P. R. R.....               |       |
| Virginia City.....                      | C. P. R. R.....               |       |
| Do.....                                 | Toner.....                    |       |
| Do..... astronomical monument.....      | Wheeler.....                  |       |
| Do..... office Chollar Potosi Mine..... | Wheeler.....                  |       |
| Do..... 165 G street.....               | Wheeler.....                  |       |
| Virgin Valley (lower).....              | Powell.....                   | }     |
| Vista.....                              | Toner.....                    |       |
| Vivian Mine.....                        | Wheeler.....                  |       |
| Wadsworth.....                          | C. P. R. R.....               |       |
| Do.....                                 | Wheeler.....                  |       |
| Wah-ya-bah Springs.....                 | Wheeler.....                  |       |
| Walker's Lake.....                      | Pacific R. R. Reports.....    |       |
| Do.....                                 | Carson and Colorado R. R..... |       |
| Walker's Ranch.....                     | Wheeler.....                  |       |
| Walker's River Basin.....               |                               |       |
| Walker's River Meadows.....             |                               |       |
| Wallace's Ranch.....                    | Wheeler.....                  |       |
| Wall Spring.....                        | Wheeler.....                  |       |
| Wanahonupe Valley.....                  | Simpson.....                  |       |
| Washington.....                         | Wheeler.....                  |       |
| Washoe City.....                        | Wheeler.....                  |       |
| Washoe Lake.....                        | Wheeler.....                  |       |
| Washoe Valley.....                      | Hayden.....                   |       |
| Water Cañon.....                        |                               |       |
| Wauguyhi Peak.....                      | King.....                     |       |
| Wenhabah Range.....                     | Simpson.....                  | }     |
| Welche's Ranch.....                     | Wheeler.....                  |       |
| Welch's Station.....                    | Wheeler.....                  |       |
| Wells.....                              | C. P. R. R.....               |       |
| West Belcher Mine.....                  | Wheeler.....                  |       |
| West Gate.....                          | Wheeler.....                  |       |
| West Point.....                         | Wheeler.....                  |       |
| Wheeler Peak.....                       | Wheeler.....                  |       |
| Do..... timber line on.....             |                               |       |
| White Bluff Spring.....                 | Wheeler.....                  |       |

| Station.                         | Authority.               | Elevation.   |
|----------------------------------|--------------------------|--------------|
|                                  |                          | <i>Page.</i> |
| White Pine Range Pass .....      | Wheeler.....             | 5,860        |
| Do.....                          | Wheeler.....             | 6,326        |
| White Pine Valley.....           | Wheeler.....             | 6,000        |
| White Plains .....               | C. P. R. R.....          | 3,594        |
| White Rock.....                  | Wheeler.....             | 4,818        |
| Wilcox Ranch.....                | Wheeler.....             | 5,396        |
| William Penn Mine .....          | Wheeler.....             | 5,236        |
| Willow Spring .....              | .....                    | 5,859        |
| Winnemucca .....                 | C. P. R. R.....          | 4,332        |
| Do..... Signal Office .....      | U. S. Signal Office..... | 4,327        |
| Winnemucca Lake .....            | Wheeler.....             | 3,825        |
| Winnemucca Peak .....            | King.....                | 6,869        |
| Winter's Ranch .....             | Wheeler.....             | 5,145        |
| Woodruff Valley .....            | Simpson.....             | 6,000        |
| Wood's Ranch, Pyramid Lake ..... | Wheeler.....             | 3,861        |
| Worthington Peak .....           | Wheeler.....             | 8,400        |

# NEW HAMPSHIRE.

| Station.                                               | Authority.                      | Elevation.   |
|--------------------------------------------------------|---------------------------------|--------------|
|                                                        |                                 | <i>Feet.</i> |
| Adam's Mountain .....                                  | Appalachian Club .....          | 5,776        |
| Do.....Sam Adams' Peak .....                           | Appalachian Club .....          | 5,554        |
| Do.....J. Q. Adams' Peak .....                         | Appalachian Club .....          | 5,384        |
| Do.....Nowell's Peak .....                             | Appalachian Club .....          | 5,313        |
| Alton Bay Hotel .....                                  | Suncook Valley R. R. ....       | 530          |
| Ammonoosuc Station, base of Mount<br>Washington .....  | Bost., Con. & Mont. R. R. ....  | 2,668        |
| Andover .....                                          | Northern R. R. ....             | 628          |
| Ashuelot .....                                         | Ashuelot R. R. ....             | 434          |
| Atkinson .....                                         | Boston & Maine R. R. ....       | 57           |
| Bald Mountain, Franconia Notch .....                   | Appalachian Club .....          | 2,310        |
| Barnstead Centre .....                                 | Suncook Valley R. R. ....       | 527          |
| Bath .....                                             | Bost., Con. & Mont. R. R. ....  | 521          |
| Belknap Mountain, lower peak of the Twins .....        | Appalachian Club .....          | 2,259        |
| Bemis Station, Hart's location .....                   | Port. & Ogden R. R. ....        | 996          |
| Berlin Falls .....                                     | Grand Trunk R. R. ....          | 1,016        |
| Bethlehem .....                                        | Bost. Con. & Mont. R. R. ....   | 1,187        |
| Do.....Sinclair House .....                            | Appalachian Club .....          | 1,459        |
| Do.....Maplewood House .....                           | Appalachian Club .....          | 1,480        |
| Black Mountain, Sandwich Dome, highest<br>peak .....   | Appalachian Club .....          | 4,071        |
| Do.....Jennings Peak .....                             | Appalachian Club .....          | 3,587        |
| Do.....Sachem Peak, higher .....                       | Appalachian Club .....          | 3,050        |
| Do.....                    lower .....                 | Appalachian Club .....          | 2,967        |
| Do.....Middle Acteon Peak .....                        | Appalachian Club .....          | 2,545        |
| Do.....Bald Knob .....                                 | Appalachian Club .....          | 2,391        |
| Blue Mountain .....                                    | Guyot .....                     | 4,370        |
| Boot's Spur .....                                      | Appalachian Club .....          | 5,524        |
| Boscawen .....                                         | Northern R. R. ....             | 274          |
| Boy Mountain, near Jefferson .....                     | Appalachian Club .....          | 2,278        |
| Bradford .....                                         | Concord & Claremont R. R. ....  | 679          |
| Bray Hill, Whitefield .....                            | Appalachian Club .....          | 1,637        |
| Brick House .....                                      | Guyot .....                     | 3,850        |
| Campton, Black Mountain House .....                    | Appalachian Club .....          | 687          |
| Do.....Chase's Hillside House .....                    | Appalachian Club .....          | 645          |
| Campton Hollow P. O. (approx.) .....                   | Appalachian Club .....          | 707          |
| Canaan .....                                           | Northern R. R. ....             | 956          |
| Candia .....                                           | Concord & Portsmouth R. R. .... | 445          |
| Cannon Mountain .....                                  | Guyot .....                     | 3,850        |
| Carrigain .....                                        | Guyot .....                     | 4,678        |
| Carr's Mountain .....                                  | Guyot .....                     | 3,480        |
| Carter Mountain .....                                  | Guyot .....                     | 4,530        |
| Chapin's Switch .....                                  | Sullivan Co. R. R. ....         | 328          |
| Charlestown .....                                      | Sullivan Co. R. R. ....         | 376          |
| Cherry Mountain .....                                  | Guyot .....                     | 3,670        |
| Chichester .....                                       | Suncook Valley R. R. ....       | 373          |
| Chicoma .....                                          | Guyot .....                     | 3,540        |
| Claremont .....                                        | Concord & Claremont R. R. ....  | 543          |
| Claremont Junction .....                               | Concord & Claremont R. R. ....  | 473          |
| Clay, Mount .....                                      | Guyot .....                     | 5,553        |
| Clinton, Mount .....                                   | Appalachian Club .....          | 4,311        |
| Do.....                                                | Guyot .....                     | 4,320        |
| Do.....Timber line on .....                            |                                 | 4,250        |
| Concord .....                                          | Concord & Claremont R. R. ....  | 252          |
| Connecticut River Bridge, near Bellow's<br>Falls ..... | Sullivan Co. R. R. ....         | 304          |
| Connecticut River Bridge, near Windsor .....           | Sullivan Co. R. R. ....         | 351          |

| Station.                                                 | Authority.                                     | Elevation.   |
|----------------------------------------------------------|------------------------------------------------|--------------|
|                                                          |                                                | <i>Feet.</i> |
| Contoocook .....                                         | Contoocook Valley R. R. ....                   | 373          |
| Conway Centre Station .....                              | Port. & Ogden R. R. ....                       | 455          |
| Conway Corner (Chateaugay), west end<br>of village ..... | P., G. F. & C. R. R. ....                      | 466          |
| Cooke's Hill, West Campton .....                         | Appalachian Club .....                         | 2,236        |
| Crawford House Station, summit .....                     | Port. & Ogden R. R. ....                       | 1,903        |
| Crawford Mountain .....                                  | Guyot .....                                    | 3,134        |
| Dalton .....                                             | Bost., Con. & Mont. R. R. ....                 | 866          |
| Danbury .....                                            | Northern R. R. ....                            | 826          |
| Deception, Mount .....                                   | Guyot .....                                    | 2,449        |
| Derry .....                                              | Manch. & Lawrence R. R. ....                   | 238          |
| Dimond's Corner .....                                    | Concord & Claremont R. R. ....                 | 425          |
| Dover .....                                              | Boston & Maine R. R. ....                      | 72           |
| Durham .....                                             | Boston & Maine R. R. ....                      | 70           |
| Eagle Cliff .....                                        | Guyot .....                                    | 3,446        |
| Eagle Head .....                                         | Guyot .....                                    | 4,216        |
| East Andover .....                                       | Northern R. R. ....                            | 661          |
| East Concord .....                                       | Geol. S'vy of N. H. ....                       | 246          |
| East Haverhill .....                                     | Bost., Con. & Mont. R. R. ....                 | 773          |
| East Jaffrey .....                                       | Monadnock & Petersboro R. R. ....              | 1,032        |
| East Kingston .....                                      | Boston & Maine R. R. ....                      | 130          |
| East Lebanon .....                                       | Northern R. R. ....                            | 766          |
| East Rindge .....                                        | Monadnock & Petersboro R. R. ....              | 1,003        |
| East Wakefield .....                                     | P., G. F. & C. R. R. ....                      | 678          |
| East Westmoreland .....                                  | Cheshire R. R. ....                            | 709          |
| East Wilton .....                                        | Nashua, Wilton & Petersbor-<br>ough R. R. .... | 328          |
| Echo Lake .....                                          | Guyot .....                                    | 1,926        |
| Do .....                                                 | Appalachian Club .....                         | 1,929        |
| Echo Mountain .....                                      | Guyot .....                                    | 3,170        |
| Elkin's Fisher, Tecumseh Group .....                     | Appalachian Club .....                         | 2,621        |
| Elliot .....                                             | P., G. F. & C. R. R. ....                      | 21           |
| Enfield .....                                            | Northern R. R. ....                            | 768          |
| Epping .....                                             | Concord & Portsmouth R. R. ....                | 154          |
| Epsom .....                                              | Geol. Survey of N. H. ....                     | 342          |
| Do .....                                                 | Suncook Valley R. R. ....                      | 362          |
| Do M. M. Steele's residence .....                        | Appalachian Club .....                         | 781          |
| Exeter .....                                             | Boston & Maine R. R. ....                      | 58           |
| Fabyan House .....                                       | Bost., Con. & Mont. R. R. ....                 | 1,571        |
| Fisher Mountain, Tecumseh Group .....                    | Appalachian Club .....                         | 3,470        |
| Fitzwillian .....                                        | Cheshire R. R. ....                            | 1,063        |
| Fort Mountain, Epsom .....                               | Appalachian Club .....                         | 1,431        |
| Franconia, Franconia House .....                         | Do .....                                       | 1,054        |
| Do Lafayette House .....                                 | Appalachian Club .....                         | 990          |
| Franklin .....                                           | Northern R. R. ....                            | 363          |
| Franklin, Mount .....                                    | Appalachian Club .....                         | 4,917        |
| Do .....                                                 | Guyot .....                                    | 4,904        |
| Gilford, Locke's Farm-house .....                        | Appalachian Club .....                         | 643          |
| Gilmanton Hill .....                                     | Guyot .....                                    | 1,329        |
| Gilmanton, Iron Works Village .....                      | Suncook Valley R. R. ....                      | 647          |
| Glen Station .....                                       | Port. & Ogden R. R. ....                       | 530          |
| Goffstown Station .....                                  | Manch. & N. Weare R. R. ....                   | 304          |
| Gorham .....                                             | Grand Trunk R. R. ....                         | 794          |
| Grafton .....                                            | Northern R. R. ....                            | 848          |
| Grafton Centre .....                                     | Northern R. R. ....                            | 872          |
| Great Falls .....                                        | Boston & Maine R. R. ....                      | 178          |
| Do (Conway) Junction .....                               | P., G. F. & C. R. R. ....                      | 90           |
| Greenfield .....                                         | Petersborough R. R. ....                       | 800          |
| Green Mountain, Tecumseh Group .....                     | Appalachian Club .....                         | 3,547        |
| Green's Cliff .....                                      | Guyot .....                                    | 1,329        |
| Groveton .....                                           | Grand Trunk R. R. ....                         | 884          |
| Groveton Junction .....                                  | Bost., Con. & Mont. R. R. ....                 | 901          |
| Gunstock Mountain .....                                  | Appalachian Club .....                         | 2,400        |
| Hampstead Station .....                                  | Nashua & Rochester R. R. ....                  | 258          |

| Station.                                           | Authority.                       | Elev |
|----------------------------------------------------|----------------------------------|------|
| Harrisville.....                                   | Manch. & N. Weare R. R....       |      |
| Haverhill Depot.....                               | Conn. & Pass. R. R.....          |      |
| Henniker.....                                      | Contoocook Valley R. R....       |      |
| Hillsborough Bridge Station.....                   | Contoocook Valley R. R....       |      |
| Hollis.....                                        | Worcester & Nashua R. R....      |      |
| Jefferson, Mount Adams House.....                  |                                  |      |
| Do... Starr King House.....                        | Appalachian Club.....            |      |
| Jefferson, Mount.....                              | Guyot.....                       |      |
| Kearsarge Mt.....                                  | Eastman.....                     |      |
| Keene.....                                         | Ashuelot R. R.....               |      |
| Kendall's Crossing.....                            | Sullivan Co. R. R.....           |      |
| Kinsman Mountain.....                              | Guyot.....                       |      |
| Do..... highest summit seen<br>from Lafayette..... | Appalachian Club.....            |      |
| Kittery.....                                       | P., G. F. & C. R. R....          |      |
| Lafayette, Mount.....                              | Appalachian Club.....            |      |
| Do.....                                            | Guyot.....                       |      |
| Do..... lower north peak.....                      |                                  |      |
| Do..... Eagle Lakes.....                           |                                  |      |
| Do..... Eagle Cliff Notch.....                     |                                  |      |
| Lake of the Clouds.....                            | Guyot.....                       |      |
| Do.....                                            | Appalachian Club.....            |      |
| Lancaster.....                                     | Bost., Con. & Mont. R. R....     |      |
| Lebanon.....                                       | Northern R. R.....               |      |
| Lincoln Mountain.....                              | Appalachian Club.....            |      |
| Lisbon.....                                        | Bost., Con. & Mont. R. R....     |      |
| Littlefield's Crossing.....                        | Concord & Portsmouth R. R....    |      |
| Little Monroe Mountain.....                        | Guyot.....                       |      |
| Do.....                                            | Appalachian Club.....            |      |
| Littleton.....                                     | Bost., Con. & Mont. R. R....     |      |
| Do... Oak Hill House.....                          | Appalachian Club.....            |      |
| Lyndeborough.....                                  | Petersborough R. R.....          |      |
| Madbury.....                                       | Boston & Maine R. R.....         |      |
| Madison, Mount.....                                | Appalachian Club.....            |      |
| Do.....                                            | Geol. S'v'y of N. H.....         |      |
| Madison, N. W. end of 6-mile pond.....             | P., G., F. & C. R. R....         |      |
| Mad River Peak.....                                | Guyot.....                       |      |
| Manchester.....                                    | Manch. & Lawrence R. R....       |      |
| Marlborough.....                                   | Cheshire R. R.....               |      |
| Mast Yard.....                                     | Concord & Claremont R. R....     |      |
| Meredith Village.....                              | Bost., Con. & Mont. R. R....     |      |
| Middle Fisher Mountain, Tecumseh Group.....        | Appalachian Club.....            |      |
| Milan.....                                         | Grand Trunk R. R.....            |      |
| Milton Station.....                                | P., G., F. & C. R. R....         |      |
| Monadnock, Mount.....                              | Guyot.....                       |      |
| Monroe, Mount.....                                 | Appalachian Club.....            |      |
| Moose hillock.....                                 | Guyot.....                       |      |
| Morijah, Mount.....                                | Guyot.....                       |      |
| Mount Sunapee Station.....                         | Concord & Claremont R. R....     |      |
| Nashua.....                                        | Boston, Lowell & Nashua R. R.... |      |
| Do. Main street.....                               | Nashua, Acton & Boston R. R....  |      |
| Do. Concord depot.....                             | Worcester & Nashua R. R....      |      |
| Do. Lake street.....                               | Nashua, Acton & Boston R. R....  |      |
| Newbury Summit, on rail.....                       | Concord & Claremont R. R....     |      |
| Do..... (rock cut) over rail.....                  | Concord & Claremont R. R....     |      |
| Newmarket.....                                     | Boston & Maine R. R.....         |      |
| Newmarket Junction.....                            | Concord & Portsmouth R. R....    |      |
| Newport.....                                       | Concord & Claremont R. R....     |      |
| Newton.....                                        | Boston & Maine R. R.....         |      |
| Do. R. R. Summit.....                              | Boston & Maine R. R.....         |      |
| North Boscawen.....                                | Northern R. R.....               |      |
| North Charlestown.....                             | Sullivan Co. R. R.....           |      |
| North Conway Station.....                          | P., G. F. & C. R. R....          |      |
| Do..... (village plains).....                      | Port. & Ogden R. R.....          |      |

| Station.                                        | Authority.                   | Elevation.   |
|-------------------------------------------------|------------------------------|--------------|
|                                                 |                              | <i>Feet.</i> |
| North Lisbon.....                               | Bost., Con. & Mont. R. R.    | 667          |
| North Stratford.....                            | Grand Trunk R. R.            | 902          |
| North Weare.....                                | Manch. & N. Weare R. R.      | 489          |
| Osceola Mountain.....                           | Appalachian Club             | 4,417        |
| Osagee, $\frac{1}{2}$ mile from village.....    | P., G. F. & C. R. R.         | 642          |
| Ossipee Mountain, East Knoll.....               | Appalachian Club             | 2,774        |
| Do..... Melvin Peak.....                        | Appalachian Club             | 2,950        |
| Owl's Head.....                                 | Guyot                        | 2,950        |
| Do..... (Cherry Mountain).....                  | Appal. Club                  | 3,302        |
| Parker's Station.....                           | Manch. & N. Weare R. R.      | 319          |
| Pemigewasset Peak.....                          | Guyot                        | 4,420        |
| Petersboro Village.....                         | Monadnock & Petersboro R. R. | 744          |
| Piper Mountain, lowest peak of the Belknap..... | Appalachian Club             | 2,063        |
| Pittsfield.....                                 | Suncook Valley R. R.         | 493          |
| Plaistow.....                                   | Boston & Maine R. R.         | 92           |
| Do..... brickyard.....                          | Boston & Maine R. R.         | 86           |
| Pleasant, Mount.....                            | Guyot                        | 4,764        |
| Do.....                                         | Appalachian Club             | 4,771        |
| Pleasant, Mount.....                            | Appalachian Club             | 1,896        |
| Plymouth.....                                   | Bost., Con. & Mont. R. R.    | 473          |
| Profile Lake.....                               | Appalachian Club             | 1,747        |
| Profile Mountain, true summit.....              | Appalachian Club             | 4,114        |
| Prospect Mountain, Lancaster.....               | Appalachian Club             | 2,062        |
| Raymond.....                                    | Concord & Portsmouth R. R.   | 198          |
| Rochester.....                                  | Nashua & Rochester R. R.     | 226          |
| Rollinsford.....                                | Boston & Maine R. R.         | 115          |
| Rowe's Hill, West Campton.....                  | Appalachian Club             | 1,235        |
| Rumney.....                                     | Bost., Con. & Mont. R. R.    | 520          |
| Russell's (or S. Greenfield).....               | Petersborough R. R.          | 820          |
| Salmon Falls.....                               | Boston & Maine R. R.         | 107          |
| Sandwich Dome.....                              | Guyot                        | 3,969        |
| Sandwich Notch, Campton, Sandwich road.....     | Appalachian Club             | 1,754        |
| Sear Ridge, Thornton Gore.....                  | Appalachian Club             | 3,824        |
| Scott's Mills, crossing B., C. & M. R. R.....   | Port. & Ogden R. R.          | 860          |
| Shelburne.....                                  | Grand Trunk R. R.            | 704          |
| Sinapee, Mount.....                             | Petermann                    | 1,636        |
| South Charlestown.....                          | Sullivan Co. R. R.           | 303          |
| South Danbury.....                              | Northern R. R.               | 732          |
| South Keene.....                                | Cheshire R. R.               | 560          |
| South Lancaster.....                            | Bost., Con. & Mont. R. R.    | 867          |
| South Newmarket.....                            | Boston & Maine R. R.         | 38           |
| Springfield.....                                | Sullivan Co. R. R.           | 374          |
| Stark.....                                      | Grand Trunk R. R.            | 954          |
| Star Lake, between Madison and Adams.....       | Appalachian Club             | 4,690        |
| Starr King, Mount.....                          | Appalachian Club             | 3,943        |
| Stone Mountain, Tecumseh Group.....             | Appalachian Club             | 3,376        |
| Stratford Hollow.....                           | Grand Trunk R. R.            | 863          |
| Sugar Hill, Coast Survey Signal.....            |                              | 1,781        |
| Do..... Goodnow House.....                      | Appalachian Club             | 1,334        |
| Do..... post-office.....                        |                              | 1,351        |
| Sunapee.....                                    | Concord & Claremont R. R.    | 956          |
| Sunset Hill, Campton Village.....               | Appalachian Club             | 1,035        |
| Swanzy.....                                     | Ashuelot R. R.               | 473          |
| Table Mountain.....                             | Guyot                        | 3,305        |
| Taylor's Hill, West Campton.....                | Appalachian Club             | 1,406        |
| Tecumseh Mountain, highest peak.....            |                              | 4,105        |
| Do..... S. W. shoulder.....                     |                              | 3,878        |
| Tremont.....                                    | Guyot                        | 3,393        |
| Troy.....                                       | Cheshire R. R.               | 1,002        |
| Twin Mountain.....                              | Guyot                        | 4,930        |
| Twin Mountain Station.....                      | Bost., Con. & Mont. R. R.    | 1,375        |
| Upper Bartlett Station.....                     | Port. & Ogden R. R.          | 660          |
| Wakefield Station.....                          | P., G. F. & C. R. R.         | 690          |



| Station.                                                 | Authority.                    | Elevation.   |
|----------------------------------------------------------|-------------------------------|--------------|
|                                                          |                               | <i>Feet.</i> |
| Wallace Hill, Bethlehem.....                             | Appalachian Club.....         | 2, 124       |
| Walpole.....                                             | Cheshire R. R.....            | 217          |
| Warner.....                                              | Concord & Claremont R. R....  | 422          |
| Warren.....                                              | Bost., Con. & Mont. R. R..... | 736          |
| Washington, Mount.....                                   | Guyot.....                    | 6, 288       |
| Do.....                                                  | Appalachian Club.....         | 6, 285       |
| Do.....                                                  | Bost., Con. & Mont. R. R..... | 6, 293       |
| Do..... Nelson's crag.....                               | Appalachian Club.....         | 5, 615       |
| Do..... Lion's Head.....                                 | Appalachian Club.....         | 5, 016       |
| Do..... top south wall Hunt-<br>ington's ravine.....     | Appalachian Club.....         | 5, 432       |
| Do..... Signal Station.....                              | U. S. Signal Office.....      | 6, 286       |
| Do..... Timber line on.....                              | Bost., Con. & Mont. R. R..... | 4, 150       |
| Waterville.....                                          | Appalachian Club.....         | 1, 536       |
| Weetamoo Mountain, Campton.....                          | Appalachian Club.....         | 2, 546       |
| Welch Mountain, lower peak.....                          | Appalachian Club.....         | 2, 657       |
| Do..... higher peak or "Dicky<br>Mountain".....          | Appalachian Club.....         | 2, 788       |
| West Andover.....                                        | Northern R. R.....            | 677          |
| West Campton, Blair's Hotel.....                         | Appalachian Club.....         | 556          |
| Do..... Sanborn's Hotel.....                             | Appalachian Club.....         | 571          |
| Do..... post-office.....                                 | Appalachian Club.....         | 623          |
| Do..... Rising Sun Church.....                           | Appalachian Club.....         | 1, 103       |
| West Canaan.....                                         | Northern R. R.....            | 813          |
| West Claremont.....                                      | Sullivan Co. R. R.....        | 406          |
| West Concord.....                                        | Concord & Claremont R. R....  | 354          |
| West Hopkinton.....                                      | Contoocook Valley R. R.....   | 392          |
| West Lebanon.....                                        | Northern R. R.....            | 376          |
| West Milan.....                                          | Grand Trunk R. R.....         | 906          |
| Westmoreland.....                                        | Cheshire R. R.....            | 512          |
| West Ossipee.....                                        | P., G. F. & C. R. R.....      | 428          |
| Westport.....                                            | Ashuelot R. R.....            | 470          |
| Whiteface.....                                           | Guyot.....                    | 4, 030       |
| Whitefield.....                                          | Bost., Con. & Mont. R. R....  | 931          |
| Do..... Dodge's Mountain View House<br>(approx.).....    | Appalachian Club.....         | 1, 279       |
| Do..... Fiske's Cherry Mountain House.....               | Appalachian Club.....         | 1, 249       |
| White Mountain House.....                                | Bost., Con. & Mont. R. R..... | 1, 556       |
| Wild Cat Mountain.....                                   | Guyot.....                    | 4, 350       |
| Willey House Station.....                                | Port. & Ogden R. R.....       | 1, 608       |
| Willey, Mount.....                                       | Guyot.....                    | 4, 300       |
| Wilton.....                                              | Petersborough R. R.....       | 328          |
| Winchendon Village, crossing Cheshire Rail-<br>road..... | Monadnock & Petersboro R. R.  | 992          |
| Winchester.....                                          | Ashuelot R. R.....            | 448          |
| Windham.....                                             | Mauch. & Lawrence R. R.....   | 324          |
| Windsor Railroad Bridge (center).....                    | Sullivan Co. R. R.....        | 352          |
| Winnipiseogee Lake.....                                  | Suncook Valley R. R.....      | 500          |
| Do..... Lake survey, October, 1871.....                  | P., G. F. & C. R. R.....      | 501          |
| Do..... March 26, 1872.....                              | P., G. F. & C. R. R.....      | 498          |
| Wolfborough Junction, 50 miles from Ports-<br>mouth..... | P., G. F. & C. R. R.....      | 574          |
| Woodstock, Isaac Fox's boarding house....                | Appalachian Club.....         | 749          |
| Woodsville.....                                          | Bost., Con. & Mont. R. R..... | 448          |

# NEW JERSEY.

| Station.                                                    | Authority.                     | Elevation.   |
|-------------------------------------------------------------|--------------------------------|--------------|
|                                                             |                                | <i>Feet.</i> |
| Allendale .....                                             | N. Y., L. E. & W. R. R .....   | 270          |
| Allen's Pond .....                                          | N. J. Geol. Survey .....       | 897          |
| Amboy, in passenger house on wharf .....                    | Camden & A. R. R .....         | 12           |
| Andover, depot .....                                        | Sussex R. R .....              | 636          |
| Asbury .....                                                | N. J. C. R. R .....            | 438          |
| Atlantic City, Signal Station .....                         | U. S. Signal Office .....      | 13           |
| Augusta .....                                               | Sussex R. R .....              | 489          |
| Avondale .....                                              | N. Y., L. E. & W. R. R .....   | 95           |
| Barnesboro .....                                            | W. J. R. R .....               | 64           |
| Basking Ridge .....                                         | P. & D. R. R .....             | 379          |
| Beacon Hill .....                                           | U. S. C. & G. S .....          | 373          |
| Belleville .....                                            | N. Y., L. E. & W. R. R .....   | 26           |
| Belvidere .....                                             | Phil. & T. R. R .....          | 271          |
| Do .....                                                    | Newton & Belvidere R. R. ....  | 266          |
| Bergen Junction .....                                       | N. Y., L. E. & W. R. R .....   | 4            |
| Bergen Neck .....                                           | U. S. C. & G. S .....          | 223          |
| Berkeley Heights .....                                      | P. & D. R. R .....             | 230          |
| Bernardsville .....                                         | P. & D. R. R .....             | 372          |
| Bloomfield .....                                            | Newark & Bloomfield R. R. .... | 127          |
| Bloomsbury .....                                            | N. J. C. R. R .....            | 334          |
| Blue Mountain, summit on State line .....                   | N. J. Geol. Survey .....       | 1,527        |
| Boonton .....                                               | Morris & Essex R. R .....      | 413          |
| Boonton Branch Junction .....                               | Morris & Essex R. R .....      | 41           |
| Boonton Crossing Junction .....                             | Morris & Essex R. R .....      | 554          |
| Boonton (Sheep's Hill, U. S. C. & G. S. Sta-<br>tion) ..... | N. J. Geol. Survey .....       | 943          |
| Bordentown, mean tide in Delaware River .....               | Del. & Raritan Canal .....     | 1            |
| Bound Brook .....                                           | N. J. C. R. R .....            | 36           |
| Branchville Hotel .....                                     | N. J. Geol. Survey .....       | 582          |
| Bray's Hill Summit .....                                    | N. J. C. R. R .....            | 365          |
| Bridgeton .....                                             | W. J. R. R .....               | 51           |
| Broadway .....                                              | Morris & Essex R. R .....      | 377          |
| Bull's Island, head of .....                                | Phil. & T. R. R .....          | 97           |
| Do .....                                                    | Phil. & T. R. R .....          | 74           |
| Camden, Court-House .....                                   | U. S. C. & G. S .....          | 30           |
| Camden .....                                                | W. J. R. R .....               | 6            |
| Cape May, Signal Station .....                              | U. S. Signal Office .....      | 27           |
| Carpenterville .....                                        | Phil. & T. R. R .....          | 178          |
| Centreville .....                                           | N. Y., L. E. & W. R. R .....   | 132          |
| Chatham .....                                               | Morris & Essex R. R .....      | 233          |
| Chester .....                                               | C. R. R .....                  | 686          |
| Do U. S. C. & G. S. Station .....                           | N. J. Geol. Survey .....       | 790          |
| Chester Junction .....                                      | Morris & Essex R. R .....      | 691          |
| Clayton .....                                               | M. & G. R. R .....             | 123          |
| Clementon, Jaggert's house .....                            | U. S. C. & G. S .....          | 76           |
| Clifton .....                                               | N. Y., L. E. & W. R. R .....   | 56           |
| Clinton .....                                               | N. J. C. R. R .....            | 349          |
| Convent .....                                               | Morris & Essex R. R .....      | 281          |
| Cookstown .....                                             | U. S. C. & G. S .....          | 99           |
| Copper Hill .....                                           | F. R. R .....                  | 159          |
| Cranberry Reservoir (water) .....                           | Sussex R. R .....              | 772          |
| Do .....                                                    | Sussex R. R .....              | 780          |
| Crane Mountain, U. S. C. & G. S. Station ..                 | U. S. C. & G. S .....          | 665          |
| Crawford .....                                              | N. J. C. R. R .....            | 72           |
| Crystal Lake .....                                          | W. J. R. R .....               | 2            |
| Culver's Gap, 1st summit .....                              | N. J. Geol. Survey .....       | 896          |
| Do .....                                                    | N. J. Geol. Survey .....       | 931          |
| Do .....                                                    | N. J. Geol. Survey .....       | 1,319        |

| Station.                                          | Authority.                    | Elevation.   |
|---------------------------------------------------|-------------------------------|--------------|
|                                                   |                               | <i>Feet.</i> |
| Culver's Pond .....                               | N. J. Geol. Survey .....      | 839          |
| Denville .....                                    | Morris & Essex R. R. ....     | 523          |
| Disboro .....                                     | U. S. C. & G. S. ....         | 276          |
| Dover .....                                       | U. S. C. & G. S. ....         | 575          |
| Drake's Pond .....                                | N. J. Geol. Survey .....      | 581          |
| Drakesville .....                                 | Morris & Essex R. R. ....     | 797          |
| East Freehold .....                               | F. & N. Y. R. R. ....         | 173          |
| East Newark .....                                 | N. Y., L. E. & W. R. R. ....  | 32           |
| Easton .....                                      | N. J. C. R. R. ....           | 160          |
| Elizabeth .....                                   | N. J. C. R. R. ....           | 29           |
| Essex .....                                       | N. Y., L. E. & W. R. R. ....  | 127          |
| Finley Station .....                              | W. J. R. R. ....              | 107          |
| Flagtown .....                                    | N. J. C. R. R. ....           | 137          |
| Flemington .....                                  | F. R. R. ....                 | 182          |
| Do..... junction with Bel. & Del. R. R. ....      | F. R. R. ....                 | 76           |
| Do..... Station, track .....                      | N. J. C. R. R. ....           | 195          |
| Do..... crossing .....                            |                               | 104          |
| Franklin .....                                    | N. Y., L. E. & W. R. R. ....  | 81           |
| Franklin Furnace Pond .....                       | N. J. Geol. Survey .....      | 531          |
| Franklinville .....                               | M. & G. R. R. ....            | 103          |
| Freehold .....                                    | F. & N. Y. R. R. ....         | 168          |
| Freehold Junction .....                           | F. & N. Y. R. R. ....         | 33           |
| Frenchtown .....                                  | Phil. & T. R. R. ....         | 128          |
| Glassborough .....                                | M. & G. R. R. ....            | 149          |
| Gloucester .....                                  | W. J. R. R. ....              | 16           |
| Do..... Buena Vista Hotel .....                   | U. S. C. & G. S. ....         | 11           |
| Hackettsown .....                                 | Morris & Essex R. R. ....     | 569          |
| Haddonfield .....                                 | Camden & Amboy R. R. ....     | 72           |
| Do..... .....                                     | U. S. C. & G. S. ....         | 74           |
| Hanan's Pond .....                                | W. J. R. R. ....              | 87           |
| Hardings .....                                    | W. J. R. R. ....              | 140          |
| Hartford, Rodgers house .....                     | U. S. C. & G. S. ....         | 48           |
| Hasteds .....                                     | W. J. R. R. ....              | 96           |
| Hawthorne .....                                   | N. Y., L. E. & W. R. R. ....  | 50           |
| High Bridge .....                                 | N. J. C. R. R. ....           | 335          |
| High Knob .....                                   | N. J. Geol. Survey .....      | 1,799        |
| Do..... Pond .....                                | N. J. Geol. Survey .....      | 1,574        |
| Hightstown .....                                  | Camden & Amboy R. R. ....     | 99           |
| Hillsdale .....                                   | F. & N. Y. R. R. ....         | 143          |
| Hoboken .....                                     | Morris & Essex R. R. ....     | 7            |
| Hohokus .....                                     | N. Y., L. E. & W. R. R. ....  | 190          |
| Holmdel Cross-Roads .....                         | U. S. C. & G. S. ....         | 135          |
| Hopating Lake .....                               | Toner .....                   | 414          |
| Hope .....                                        | Newton & Belvidere R. R. .... | 451          |
| Hornerstown .....                                 | U. S. C. & G. S. ....         | 83           |
| Horton's .....                                    | C. R. R. ....                 | 695          |
| Howell P. O. ....                                 | Newton & Belvidere R. R. .... | 565          |
| Ironia .....                                      | C. R. R. ....                 | 702          |
| Jamesburg .....                                   | Camden & Amboy R. R. ....     | 73           |
| Do..... Junction .....                            | Camden & Amboy R. R. ....     | 92           |
| Jersey City .....                                 | N. Y., L. E. & W. R. R. ....  | 5            |
| Johnsburg .....                                   | Newton & Belvidere R. R. .... | 571          |
| Keyport, Morris house .....                       | U. S. C. & G. S. ....         | 16           |
| Do..... Broad street .....                        | F. N. & N. Y. R. R. ....      | 32           |
| Do..... First street .....                        | F. N. & N. Y. R. R. ....      | 16           |
| Kingsland .....                                   | Morris & Essex R. R. ....     | 24           |
| Kingston (Lock) .....                             | Del. & Raritan Canal .....    | 57           |
| Do..... intersec. R. H. R. & Old C. & A. Br. .... | Camden & Amboy R. R. ....     | 60           |
| Lafayette, grade line in .....                    | Sussex R. R. ....             | 566-571      |
| Lake View .....                                   | N. Y., L. E. & W. R. R. ....  | 93           |
| Lambertville .....                                | Phil. & T. R. R. ....         | 75           |
| Do..... .....                                     | Del. & Raritan Canal .....    | 59           |
| Do..... lock .....                                | Del. & Raritan Canal .....    | 69           |
| Lebanon .....                                     | N. J. C. R. R. ....           | 298          |

| Station.                    | Authority.                     | Elevation.   |
|-----------------------------|--------------------------------|--------------|
|                             |                                | <i>Feet.</i> |
|                             | U. S. C. & G. S .....          | 85           |
|                             | N. J. Geol. Survey .....       | 710          |
|                             | Morris & Essex R. R .....      | 176          |
| Wart Pond .....             | N. J. Geol. Survey .....       | 479          |
|                             | N. J. Geol. Survey .....       | 862          |
|                             | W. V. R. R. ....               | 419          |
|                             | C. R. R. ....                  | 713          |
|                             | Morris & Essex R. R .....      | 247          |
|                             | N. Y., L. E. & W. R. R .....   | 310          |
|                             | M. & G. R. R. ....             | 106          |
|                             | N. J. C. R. R. ....            | 76           |
| nd .....                    | N. J. Geol. Survey .....       | 602          |
|                             | W. J. R. R. ....               | 36           |
|                             | F. & N. Y. R. R .....          | 156          |
|                             | W. J. R. R. ....               | 120          |
| ok .....                    | Phil. & T. R. R .....          | 234          |
|                             | F. & N. Y. R. R .....          | 48           |
| attle's gate .....          | U. S. C. & G. S .....          | 55           |
| onch-mark at .....          | U. S. C. & G. S .....          | 56           |
|                             | Phil. & T. R. R .....          | 140          |
|                             | Morris & Essex R. R .....      | 150          |
|                             | P. & D. R. R. ....             | 279          |
|                             | M. & G. R. R. ....             | 36           |
| on, bench-mark at .....     | U. S. C. & G. S .....          | 6            |
|                             | W. J. R. R. ....               | 134          |
|                             | Newark & Bloomfield R. R ..... | 239          |
|                             | F. & N. Y. R. R .....          | 116          |
| Clarke's house .....        | U. S. C. & G. S .....          | 167          |
| Frazer's house .....        | U. S. C. & G. S .....          | 172          |
|                             | Morris & Essex R. R .....      | 405          |
|                             | N. J. Geol. Survey .....       | 920          |
|                             | U. S. C. & G. S .....          | 69           |
|                             | Morris & Essex R. R .....      | 328          |
|                             | F. R. R. R. ....               | 147          |
|                             | U. S. C. & G. S .....          | 181          |
| Garden street .....         | U. S. C. & G. S .....          | 41           |
| Rhees House .....           | U. S. C. & G. S .....          | 38           |
| R. R. bridge .....          | U. S. C. & G. S .....          | 15           |
| Hotel .....                 | N. J. G. S .....               | 850          |
|                             | N. J. C. R. R .....            | 77           |
| ghlands Light-house, bench- |                                |              |
|                             | U. S. C. & G. S .....          | 208          |
|                             | N. J. C. R. R .....            | 94           |
|                             | N. Y., L. E. & W. R. R .....   | 13           |
|                             | M. & G. R. R. ....             | 114          |
| n (Junction) .....          | Warren R. R. ....              | 508          |
| Summit .....                | N. J. C. R. R .....            | 513          |
|                             | N. J. C. R. R .....            | 61           |
|                             | Newton & Belvidere R. R .....  | 610          |
| end of depot .....          | Sussex R. R. ....              | 607          |
|                             | N. J. C. R. R .....            | 93           |
| nd .....                    | M. & G. R. R. ....             | 107          |
|                             | Morris & Essex R. R .....      | 187          |
|                             | Warren R. R. ....              | 491          |
|                             | W. J. R. R. ....               | 116          |
|                             | N. Y., L. E. & W. R. R .....   | 55           |
|                             | N. Y., L. E. & W. R. R .....   | 89           |
| tion .....                  | N. Y., L. E. & W. R. R .....   | 92           |
|                             | U. S. C. & G. S .....          | 42           |
|                             | U. S. C. & G. S .....          | 35           |
| L. Valley R. R .....        | Phil. & T. R. R .....          | 198          |
|                             | W. J. R. R. ....               | 112          |
|                             | U. S. C. & G. S .....          | 202          |
|                             | N. J. C. R. R .....            | 145          |

| Station.                                                                | Authority.                    | Elevation.   |
|-------------------------------------------------------------------------|-------------------------------|--------------|
|                                                                         |                               | <i>Feet.</i> |
| Port Jervis Depot .....                                                 | N. J. Geol. Survey .....      | 441          |
| Port Morris .....                                                       | Morris & Essex R. R. ....     | 922          |
| Port Murray .....                                                       | Morris & Essex R. R. ....     | 588          |
| Prallsville .....                                                       | Phil. & T. R. R. ....         | 86           |
| Princeton, on street-crossing in front of<br>bank .....                 | Camden & Amboy R. R. ....     | 221          |
| Do .....                                                                | Camden & Amboy R. R. ....     | 207          |
| Princeton Junction .....                                                | Camden & Amboy R. R. ....     | 83           |
| Ramsey's .....                                                          | N. Y., L. E. & W. R. R. ....  | 345          |
| Red Bank, bench-mark at .....                                           | U. S. C. & G. S. ....         | 38           |
| Reigelsville .....                                                      | Phil. & T. R. R. ....         | 166          |
| Ricefield .....                                                         | N. J. C. R. R. ....           | 109          |
| Ridgewood .....                                                         | N. Y., L. E. & W. R. R. ....  | 137          |
| Ringoes .....                                                           | F. R. R. ....                 | 248          |
| Rockaway .....                                                          | Morris & Essex R. R. ....     | 557          |
| Roseville Junction .....                                                | Newark & Bloomfield R. R. ..  | 144          |
| Rossell's Freehold .....                                                | U. S. C. & G. S. ....         | 166          |
| Rutherford .....                                                        | N. Y., L. E. & W. R. R. ....  | 50           |
| Do ... Park .....                                                       | Morris & Essex R. R. ....     | 37           |
| Sand Pond .....                                                         | N. J. Geol. Survey .....      | 1,500        |
| Sandy Hook, Signal Station .....                                        | U. S. Signal Office .....     | 28           |
| Sarepta .....                                                           | Newton & Belvidere R. R. .... | 364          |
| Scotch Plains .....                                                     | N. J. C. R. R. ....           | 156          |
| Seabright, bench-mark at .....                                          | U. S. C. & G. S. ....         | 9            |
| Somerville, bench-mark on court-house<br>grounds .....                  | U. S. C. & G. S. ....         | 82           |
| Do .....                                                                | U. S. C. & G. S. ....         | 91           |
| South Orange .....                                                      | Morris & Essex R. R. ....     | 141          |
| South Vineland .....                                                    | M. & G. R. R. ....            | 92           |
| Sparta (upper mill-dam) .....                                           | N. J. G. S. ....              | 696          |
| Spotswood .....                                                         | Camden & Amboy R. R. ....     | 29           |
| Springfield .....                                                       | N. J. C. R. R. ....           | 312          |
| Do .....                                                                | U. S. C. & G. S. ....         | 523          |
| Do ... United States Coast and Geo-<br>detic Survey Station .....       | N. J. Geol. Survey .....      | 495          |
| Spruce Run .....                                                        | N. J. C. R. R. ....           | 471          |
| Stanhope .....                                                          | Morris & Essex R. R. ....     | 873          |
| Stanley (Passaic River) .....                                           | Morris & Essex R. R. ....     | 239          |
| Stewartsville .....                                                     | Morris & Essex R. R. ....     | 377          |
| Stirling .....                                                          | P. & D. R. R. ....            | 226          |
| Stony Hill .....                                                        | U. S. C. & G. S. ....         | 235          |
| Styles .....                                                            | U. S. C. & G. S. ....         | 34           |
| Succasuna .....                                                         | C. R. R. ....                 | 709          |
| Sunfish Pond .....                                                      | N. J. Geol. Survey .....      | 504          |
| Swartwout Hotel .....                                                   | N. J. Geol. Survey .....      | 529          |
| Do ... Pond .....                                                       | N. J. Geol. Survey .....      | 478          |
| Three Bridges .....                                                     | N. J. C. R. R. ....           | 114          |
| Trenton, Lock .....                                                     | Del. & Raritan Canal .....    | 50           |
| Do ... top of dam in Assapink Creek,<br>above Green street bridge ..... | Camden & Amboy R. R. ....     | 26           |
| Do ... Clinton street station .....                                     | Phil. & T. R. R. ....         | 33           |
| Do ... Junction .....                                                   | U. S. C. & G. S. ....         | 63           |
| Tunis, Imlaystown .....                                                 | U. S. C. & G. S. ....         | 228          |
| Union .....                                                             | W. J. R. R. ....              | 143          |
| Valley .....                                                            | N. J. C. R. R. ....           | 398          |
| Vernon .....                                                            | W. V. R. R. ....              | 392          |
| Vineland .....                                                          | M. & G. R. R. ....            | 110          |
| Walkill .....                                                           | N. J. Geol. Survey .....      | 383          |
| Washington .....                                                        | Morris & Essex R. R. ....     | 507          |
| Washington's Crossing .....                                             | Phil. & T. R. R. ....         | 67           |
| Waterloo .....                                                          | Morris & Essex R. R. ....     | 717          |

| Station.                                | Authority.               | Elevation.   |
|-----------------------------------------|--------------------------|--------------|
|                                         |                          | <i>Feet.</i> |
| Watsessing.....                         | W. & B. R. R.....        | 134          |
| Weasel (U. S. C. & G. S. station.)..... | U. S. C. & G. S.....     | 583          |
| Westfield.....                          | N. J. C. R. R.....       | 133          |
| West Freehold, Mount's Corner.....      | U. S. C. & G. S.....     | 183          |
| West Summit.....                        | P. & D. R. R.....        | 293          |
| Westville.....                          | W. J. R. R.....          | 10           |
| Whitehall, depot.....                   | Sussex R. R.....         | 735          |
| White House.....                        | N. J. C. R. R.....       | 181          |
| Do.....                                 | U. S. C. & G. S.....     | 64           |
| Wichatunk.....                          | F. & N. Y. R. R.....     | 141          |
| Windsor.....                            | Camden & Amboy R. R..... | 85           |
| Woodbury.....                           | W. J. R. R.....          | 34           |
| Woodward's house.....                   | U. S. C. & G. S.....     | 188          |
| Wrightstown.....                        | U. S. C. & G. S.....     | 136          |
| Yardville.....                          | Camden & Amboy R. R..... | 53           |

# NEW MEXICO.

| Station.                          | Authority.                | Elevation.   |
|-----------------------------------|---------------------------|--------------|
|                                   |                           | <i>Feet.</i> |
| Abiquiu .....                     | Wheeler .....             | 5,930        |
| Abiquiu Peak .....                | Wheeler .....             | 11,240       |
| Acoma .....                       | Wheeler .....             | 6,423        |
| Aden .....                        | S. P. R. R. ....          | 4,393        |
| Afton .....                       | S. P. R. R. ....          | 4,209        |
| Agua Azul .....                   | Wheeler .....             | 6,682        |
| Agua Flegra .....                 | Wheeler .....             | 8,194        |
| Agua Fria .....                   | Wheeler .....             | 6,486        |
| Aqua Fria Peak .....              | Wheeler .....             | 10,965       |
| Aguajes de los Guajolotes .....   | Wheeler .....             | 6,202        |
| Agua Negra .....                  | Wheeler .....             | 8,194        |
| Alameda .....                     | Wheeler .....             | 4,906        |
| Do .....                          | A., T. & S. F. R. R. .... | 4,979        |
| Alamillo .....                    | A., T. & S. F. R. R. .... | 4,634        |
| Alamocita .....                   | Wheeler .....             | 4,256        |
| Alamo Gordo .....                 | Wheeler .....             | 4,863        |
| Alamosa .....                     | Wheeler .....             | 5,177        |
| Alamo Station .....               | Wheeler .....             | 6,593        |
| Alanuelo .....                    | Wheeler .....             | 4,693        |
| Albuquerque .....                 | Wheeler .....             | 4,919        |
| Do .....                          | A., T. & S. F. R. R. .... | 4,933        |
| Do .....                          | Mod. Dept., U. S. A. .... | 5,032        |
| Do .....                          | Pac. R. R. Reports .....  | 5,026        |
| Alcalde .....                     | D. & R. G. R. R. ....     | 5,687        |
| Aleman .....                      | Wheeler .....             | 4,594        |
| Algodones .....                   | Wheeler .....             | 5,104        |
| Do .....                          | A., T. & S. F. R. R. .... | 5,087        |
| Amargo .....                      | D. & R. G. R. R. ....     | 6,987        |
| Animas Peak .....                 | Wheeler .....             | 6,106        |
| Annaya Spring .....               | Wheeler .....             | 4,717        |
| Antelope Spring .....             | Wheeler .....             | 6,221        |
| Anthony .....                     | A., T. & S. F. R. R. .... | 3,772        |
| Anton Chico .....                 | A., T. & S. F. R. R. .... | 5,386        |
| Do .....                          | Pac. R. R. Reports .....  | 5,373        |
| Apache .....                      | Wheeler .....             | 7,324        |
| Apache Cienega .....              | Wheeler .....             | 5,291        |
| Apache Tejo .....                 | Wheeler .....             | 5,478        |
| Arch Spring .....                 | Pac. R. R. Reports .....  | 6,350        |
| Do .....                          | Wheeler .....             | 6,485        |
| Arny .....                        | A., T. & S. F. R. R. .... | 4,512        |
| Arooyo Cnerbito .....             | .....                     | 4,848        |
| Atlantic & Pacific crossing ..... | A., T. & S. F. R. R. .... | 4,874        |
| Atrisco .....                     | Pac. R. R. Reports .....  | 5,033        |
| Azotea .....                      | D. & R. G. R. R. ....     | 7,701        |
| Azul .....                        | A., T. & S. F. R. R. .... | 6,670        |
| Bacon Spring .....                | Wheeler .....             | 7,189        |
| Baldy (Elizabeth) Peak .....      | Wheeler .....             | 12,491       |
| Baldy (Santa Fé) Peak .....       | Wheeler .....             | 12,661       |
| Banded Peak .....                 | Wheeler .....             | 12,824       |
| Barney Station .....              | .....                     | 3,992        |
| Barranca .....                    | D. & R. G. R. R. ....     | 6,927        |
| Bascom, Fort .....                | Toner .....               | 3,726        |
| Bayard, Fort .....                | Wheeler .....             | 6,068        |
| Do .....                          | astronom. mont. ....      | 6,098        |
| Bear Peak .....                   | Wheeler .....             | 8,081        |
| Belen .....                       | Wheeler .....             | 4,890        |
| Do .....                          | A., T. & S. F. R. R. .... | 4,784        |

| Station.                            | Authority.                   | Elevation.   |
|-------------------------------------|------------------------------|--------------|
|                                     |                              | <i>Feet.</i> |
| Cañon Ranch.....                    | Toner.....                   | 4,820        |
| a Spring.....                       | Wheeler.....                 | 7,494        |
| .....                               | A., T. & S. F. R. R.....     | 6,056        |
| Hill.....                           | Wheeler.....                 | 7,029        |
| llo.....                            | Wheeler.....                 | 5,084        |
| .....                               | A., T. & S. F. R. R.....     | 5,031        |
| rn.....                             | D. & R. G. R. R.....         | 9,000        |
| ente.....                           | Toner.....                   | 5,406        |
| ountain.....                        | Wheeler.....                 | 8,909        |
| Peak.....                           | Wheeler.....                 | 8,910        |
| lock Tank.....                      | Wheeler.....                 | 4,180        |
| s Mill.....                         | Wheeler.....                 | 6,449        |
| rg.....                             | A., T. & S. F. R. R.....     | 6,840        |
| ater.....                           | A. & P. R. R.....            | 6,609        |
| ater Spring.....                    | Wheeler.....                 | 6,778        |
| Ranch.....                          | Wheeler.....                 | 4,021        |
| Caballo.....                        | Wheeler.....                 | 6,948        |
| k's Ranch.....                      | Wheeler.....                 | 6,882        |
| n, Camp (old).....                  | Wheeler.....                 | 7,277        |
| e.....                              | D. & R. G. R. R.....         | 7,302        |
| ry.....                             | S. P. R. R.....              | 4,226        |
| n's Ranch.....                      | Wheeler.....                 | 7,133        |
| Alamosa.....                        | Wheeler.....                 | 6,540        |
| de los Diegos.....                  | Toner.....                   | 6,145        |
| Ranch.....                          | Wheeler.....                 | 5,088        |
| Blanco.....                         | Pac. R. R. Reports.....      | 6,320        |
| Blanco Pass.....                    | K. P. R. R. Surveys.....     | 7,081        |
| ito.....                            | Wheeler.....                 | 7,023        |
| .....                               | A., T. & S. F. R. R.....     | 6,853        |
| del Agua.....                       | Wheeler.....                 | 5,916        |
| del Chaco.....                      | Wheeler.....                 | 5,839        |
| Pajareto.....                       | Wheeler.....                 | 5,099        |
| i Pass.....                         | Wheeler.....                 | 7,398        |
| i Peak.....                         | Wheeler.....                 | 10,023       |
| llo Spring.....                     | Mexican Boundary Survey..... | 4,455        |
| .....                               | Wheeler.....                 | 4,457        |
| Peak.....                           | Wheeler.....                 | 9,390        |
| Spring.....                         | Wheeler.....                 | 7,327        |
| olorado.....                        | Wheeler.....                 | 4,679        |
| .....                               | Wheeler.....                 | 6,101        |
| .....                               | A., T. & S. F. R. R.....     | 5,667        |
| lanco.....                          | Wheeler.....                 | 14,269       |
| olorado.....                        | Wheeler.....                 | 5,654        |
| e Culebra.....                      | Wheeler.....                 | 6,992        |
| ecolote.....                        | Wheeler.....                 | 7,254        |
| .....                               | D. & R. G. R. R.....         | 7,841        |
| al.....                             | Wheeler.....                 | 7,527        |
| a.....                              | D. & S. P. R. R.....         | 5,619        |
| Camp.....                           | Wheeler.....                 | 5,374        |
| .....                               | A. & P. R. R.....            | 6,969        |
| pring.....                          | Wheeler.....                 | 6,882        |
| .....                               | Wheeler.....                 | 5,647        |
| den's Ranch.....                    | Wheeler.....                 | 5,004        |
| lero Ranch.....                     | Wheeler.....                 | 5,825        |
| ta.....                             | Wheeler.....                 | 6,411        |
| Hill.....                           | Wheeler.....                 | 6,474        |
| s Amarilla.....                     | Wheeler.....                 | 7,179        |
| s San Simon.....                    | Wheeler.....                 | 3,855        |
| on.....                             | Wheeler.....                 | 6,385        |
| illa.....                           | Wheeler.....                 | 6,011        |
| .....                               | Wheeler.....                 | 6,744        |
| Rest (above valley 5,922 feet)..... | Wheeler.....                 | 9,773        |
| n.....                              | A., T. & S. F. R. R.....     | 4,356        |

(317)



| Station.                                        | Authority.                 | Elevation.   |
|-------------------------------------------------|----------------------------|--------------|
|                                                 |                            | <i>Feet.</i> |
| Colonas Ferry, Rio Grande .....                 | Wheeler .....              | 7,443        |
| Colorado Mountain .....                         | Wheeler .....              | 5,654        |
| Colorado Plaza, Rio Grande .....                | Wheeler .....              | 4,006        |
| Comanche .....                                  | D. & R. G. R. R. ....      | 6,500        |
| Comanche Cañon Pass .....                       | Wheeler .....              | 4,284        |
| Cone Peak .....                                 | Wheeler .....              | 12,600       |
| Conrad, Fort .....                              | Med. Dept. U. S. A. ....   | 4,576        |
| Constancia .....                                | Wheeler .....              | 4,711        |
| Cooke's Spring .....                            | Mexican Boundary Survey .. | 4,326        |
| Cook, Mount .....                               | Wheeler .....              | 8,330        |
| Coolidge .....                                  | A. & P. R. R. ....         | 6,975        |
| Copeland's .....                                | Wheeler .....              | 6,800        |
| Copper Mines .....                              | Emory .....                | 6,167        |
| Corrales .....                                  | Wheeler .....              | 5,091        |
| Costilla Pass .....                             | Wheeler .....              | 10,188       |
| Costilla Peak .....                             | Hayden .....               | 12,634       |
| Do .....                                        | Wheeler .....              | 12,615       |
| Cottonwood Springs .....                        | Wheeler .....              | 4,773        |
| Covero .....                                    | Pac. R. R. Reports .....   | 5,880        |
| Cow Spring .....                                | Wheeler .....              | 5,001        |
| Coyote Spring .....                             | Wheeler .....              | 7,202        |
| Coyote Water-holes .....                        | Wheeler .....              | 6,775        |
| Craig, Fort .....                               | Wheeler .....              | 4,448        |
| Do .....                                        | Med. Dept. U. S. A. ....   | 4,576        |
| Crocker .....                                   | A., T. & S. F. R. R. ....  | 4,767        |
| Cross Spring .....                              | Wheeler .....              | 6,265        |
| Cubero .....                                    | A. & P. R. R. ....         | 5,905        |
| Do .....                                        | Wheeler .....              | 6,122        |
| Cucamonga .....                                 | Wheeler .....              | 5,914        |
| Cuchilla .....                                  | Wheeler .....              | 5,680        |
| Cuchilla Negra .....                            | Wheeler .....              | 4,568        |
| Cuchillo .....                                  | Wheeler .....              | 5,195        |
| Culebra .....                                   | Wheeler .....              | 5,707        |
| Culebra Peak .....                              | Wheeler .....              | 14,050       |
| Cummings, Fort .....                            | Wheeler .....              | 4,778        |
| Do .....                                        | Wheeler .....              | 4,840        |
| Do .....                                        | (old) .....                | 4,883        |
| Cutler .....                                    | A., T. & S. F. R. R. ....  | 9,440        |
| Datili Range, Western Peak .....                | Wheeler .....              | 5,405        |
| Davis Ranch .....                               | Wheeler .....              | 5,982        |
| Deer Spring .....                               | Wheeler .....              | 6,352        |
| Defiance .....                                  | A. & P. R. R. ....         | 7,042        |
| Do .....                                        | Fort .....                 | 4,327        |
| Deming, junction with A., T. & S. F. R. R. .... | S. P. R. R. ....           | 7,617        |
| Diablo Knoll .....                              | Wheeler .....              | 6,454        |
| Dillon .....                                    | A., T. & S. F. R. R. ....  | 3,899        |
| Doña Ana .....                                  | A., T. & S. F. R. R. ....  | 5,883        |
| Dorsey .....                                    | A., T. & S. F. R. R. ....  | 6,435        |
| Dowlin's Mill .....                             | Wheeler .....              | 5,817        |
| Dover .....                                     | A., T. & S. F. R. R. ....  | 5,623        |
| Dripping Springs .....                          | Wheeler .....              | 6,757        |
| Dulce .....                                     | D. & R. G. R. R. ....      | 7,669        |
| Eagle Point (above valley 3,818 feet) .....     | Wheeler .....              | 7,976        |
| East Carrizo Cone .....                         | Wheeler .....              | 12,491       |
| Elizabeth Peak .....                            | Wheeler .....              | 8,465        |
| Elizabethtown .....                             | Wheeler .....              | 7,415        |
| Elk Spring .....                                | Wheeler .....              | 7,414        |
| El Moro .....                                   | Wheeler .....              | 4,745        |
| Engle .....                                     | A., T. & S. F. R. R. ....  | 3,940        |
| El Paso .....                                   | Mexican Boundary Survey .. | 5,123        |
| Elota .....                                     | A., T. & S. F. R. R. ....  | 7,187        |
| El Puerto de la Laguna .....                    | Wheeler .....              | 5,650        |
| El Rito .....                                   | Wheeler .....              | 5,638        |
| Do .....                                        | A. & P. R. R. ....         |              |

| Station.                        | Authority.               | Elevation.   |
|---------------------------------|--------------------------|--------------|
|                                 |                          | <i>Feet.</i> |
| .....                           | Wheeler.....             | 6,029        |
| .....                           | D. & R. G. R. R.....     | 5,799        |
| ch.....                         | Wheeler.....             | 6,080        |
| .....                           | Wheeler.....             | 8,278        |
| .....                           | Wheeler.....             | 6,177        |
| .....                           | D. & R. G. R. R.....     | 5,568        |
| .....                           | Wheeler.....             | 5,320        |
| .....                           | Wheeler.....             | 4,746        |
| igs.....                        | Wheeler.....             | 4,239        |
| .....                           | Wheeler.....             | 6,549        |
| .....                           | Wheeler.....             | 4,154        |
| .....                           | Wheeler.....             | 4,184        |
| rt.....                         | Med. Dept., U. S. A..... | 3,937        |
| .....                           | A., T. & S. F. R. R..... | 4,484        |
| .....                           | P. R. R. Reports.....    | 4,600        |
| .....                           | Wheeler.....             | 7,286        |
| l, Mount.....                   | Wheeler.....             | 6,646        |
| .....                           | A., T. & S. F. R. R..... | 6,525        |
| .....                           | S. P. R. R.....          | 4,490        |
| ng.....                         | Wheeler.....             | 7,673        |
| .....                           | Wheeler.....             | 6,117        |
| .....                           | Emory.....               | 5,915        |
| k.....                          | Wheeler.....             | 9,798        |
| ch.....                         | Wheeler.....             | 6,912        |
| .....                           | Wheeler.....             | 7,587        |
| .....                           | A. & P. R. R.....        | 6,477        |
| .....                           | Wheeler.....             | 9,920        |
| .....                           | Wheeler.....             | 6,455        |
| g.....                          | Wheeler.....             | 5,400        |
| .....                           | A., T. & S. F. R. R..... | 7,415        |
| .....                           | A., T. & S. F. R. R..... | 4,325        |
| a.....                          | Wheeler.....             | 6,407        |
| .....                           | A. & P. R. R.....        | 6,440        |
| .....                           | Wheeler.....             | 7,677        |
| .....                           | Wheeler.....             | 6,700        |
| k.....                          | Wheeler.....             | 8,352        |
| uk.....                         | Wheeler.....             | 7,396        |
| .....                           | A., T. & S. F. R. R..... | 4,433        |
| ike.....                        | Wheeler.....             | 7,149        |
| Peak.....                       | Wheeler.....             | 7,574        |
| .....                           | Wheeler.....             | 9,434        |
| i.....                          | Wheeler.....             | 5,224        |
| gs.....                         | Wheeler.....             | 7,045        |
| .....                           | Wheeler.....             | 5,065        |
| Diamond Creek.....              | Wheeler.....             | 5,545        |
| (13 miles from Magruder's)..... | Wheeler.....             | 5,782        |
| ook.....                        | Wheeler.....             | 6,479        |
| cy, near Blazer's Hill.....     | Wheeler.....             | 6,449        |
| h.....                          | Wheeler.....             | 5,290        |
| Rock.....                       | Pac. R. R. Reports.....  | 7,238        |
| .....                           | A., T. & S. F. R. R..... | 4,881        |
| rer bank).....                  | P. R. R. Reports.....    | 4,910        |
| p of bluffs).....               | P. R. R. Reports.....    | 5,052        |
| ch.....                         | Wheeler.....             | 3,738        |
| ing.....                        | Wheeler.....             | 4,783        |
| tain.....                       | Wheeler.....             | 9,534        |
| .....                           | Wheeler.....             | 8,569        |
| lo.....                         | Wheeler.....             | 5,479        |
| e.....                          | .....                    | 4,820        |
| Spring.....                     | Wheeler.....             | 6,011        |
| g.....                          | Wheeler.....             | 4,540        |
| .....                           | A. T. & S. F. R. R.....  | 6,804        |
| g.....                          | Wheeler.....             | 7,226        |

| Station.                      | Authority.                | El |
|-------------------------------|---------------------------|----|
| Kozlowaki's Ranch .....       | Wheeler .....             |    |
| La Bajada .....               | Wheeler .....             |    |
| Labato .....                  | D. & R. G. R. R. ....     |    |
| La Bolsa .....                | Wheeler .....             |    |
| La Chusca .....               | Wheeler .....             |    |
| La Cuesta .....               | Wheeler .....             |    |
| Ladrones Peak .....           | Wheeler .....             |    |
| La Glorietta .....            | Wheeler .....             |    |
| Laguna .....                  | A. & P. R. R. ....        |    |
| Do .....                      | Wheeler .....             |    |
| Laguna del Ojo Hediondo ..... | Wheeler .....             |    |
| Laguna Gallinas .....         | Wheeler .....             |    |
| Laguna Los Griegos .....      | Wheeler .....             |    |
| La Jara Valley .....          | Wheeler .....             |    |
| La Joya .....                 | A., T. & S. F. R. R. .... |    |
| Do .....                      | Wheeler .....             |    |
| Lake Peak .....               | Wheeler .....             |    |
| La Lacha Spring .....         | Wheeler .....             |    |
| La Laguna de Sal .....        | Wheeler .....             |    |
| La Mesilla .....              | Wheeler .....             |    |
| Do .. Signal Station .....    | U. S. Signal Office ..... |    |
| La Monica Springs .....       | Wheeler .....             |    |
| Lamy .....                    | A., T. & S. F. R. R. .... |    |
| Lanark .....                  | S. P. R. R. ....          |    |
| Lansing .....                 | A., T. & S. F. R. R. .... |    |
| La Pilla .....                | Wheeler .....             |    |
| La Placita .....              | Wheeler .....             |    |
| Largo Cañon .....             | A., T. & S. F. R. R. .... |    |
| Las Cruces .....              | Wheeler .....             |    |
| Do .....                      | A., T. & S. F. R. R. .... |    |
| Las Lunas .....               | A., T. & S. F. R. R. .... |    |
| Las Lunitas .....             | A., T. & S. F. R. R. .... |    |
| Las Playas .....              | Wheeler .....             |    |
| Las Tapiacitas .....          | Wheeler .....             |    |
| Las Tenejas .....             | Wheeler .....             |    |
| Las Truchas Mountain .....    | Wheeler (Theod.) .....    |    |
| Las Vegas .....               | Med. Dept. U. S. A. ....  |    |
| Do .....                      | A., T. & S. F. R. R. .... |    |
| Do .. Hot Springs .....       | A., T. & S. F. R. R. .... |    |
| La Tenajo .....               | Wheeler .....             |    |
| Laughlin's Peak .....         | Wheeler .....             |    |
| Lava .....                    | A., T. & S. F. R. R. .... |    |
| Do .....                      | D. & R. G. R. R. ....     |    |
| La Veta .....                 | Wheeler .....             |    |
| Leidendorf's Wells .....      | Wheeler .....             |    |
| Le Jarra .....                | Wheeler .....             |    |
| Lepai .....                   | S. P. R. R. ....          |    |
| Levy .....                    | A., T. & S. F. R. R. .... |    |
| Lisbon .....                  | S. P. R. R. ....          |    |
| Llano .....                   | Wheeler .....             |    |
| Llano Spring .....            | Wheeler .....             |    |
| Loma .....                    | Wheeler .....             |    |
| Loma Parda .....              | Wheeler .....             |    |
| Lomitas Spring .....          | Wheeler .....             |    |
| Lone Mountain .....           | Wheeler .....             |    |
| Lordsburgh .....              | S. P. R. R. ....          |    |
| Los Alamos .....              | Wheeler .....             |    |
| Los Brazos .....              | Wheeler .....             |    |
| Los Cerutos del Aquila .....  | Wheeler .....             |    |
| Los Chavez .....              | Wheeler .....             |    |
| Los Cornudos .....            | Wheeler .....             |    |
| Los Machos .....              | Wheeler .....             |    |
| Los Ojos (Rio Chama) .....    | Wheeler .....             |    |
| Los Pinos .....               | Wheeler .....             |    |

| Station.                                       | Authority.                   | Elevation.   |
|------------------------------------------------|------------------------------|--------------|
|                                                |                              | <i>Feet.</i> |
| Los Quelites.....                              | Wheeler.....                 | 5,134        |
| Los Tusos.....                                 | Wheeler.....                 | 7,537        |
| Luceros.....                                   | Wheeler.....                 | 7,941        |
| Lucera Spring.....                             | Wheeler.....                 | 7,585        |
| Lynn.....                                      | A., T. & S. F. R. R.....     | 7,512        |
| Lyons' Ranch.....                              | A., F. & S. F. R. R.....     | 1,397        |
| McCarthy's Ranch.....                          | A., T. & S. F. R. R.....     | 6,099        |
| McCarty.....                                   | A. & P. R. R.....            | 6,141        |
| McEver's Ranch.....                            | Wheeler.....                 | 5,086        |
| Macho or Mule Springs.....                     | Wheeler.....                 | 5,261        |
| McKnight's Ranch.....                          | Wheeler.....                 | 6,237        |
| McRae, Fort.....                               | Med. Dept. U. S. A.....      | 4,500        |
| Do.....                                        | Wheeler.....                 | 4,395        |
| Magdalena, Mount.....                          | Wheeler.....                 | 10,798       |
| Magdalena Pass.....                            | Wheeler.....                 | 4,755        |
| Magruder's.....                                | Wheeler.....                 | 5,811        |
| Mal Pais Spring.....                           | Wheeler.....                 | 4,106        |
| Mangos Spring.....                             | Wheeler.....                 | 4,799        |
| Manuelito.....                                 | A. & P. R. R.....            | 6,232        |
| Manzanares.....                                | A., T. & S. F. R. R.....     | 6,569        |
| Manzano.....                                   | Wheeler.....                 | 6,961        |
| Manzano Peak.....                              | Wheeler.....                 | 10,086       |
| Marcy, Fort.....                               | Med. Dept. U. S. A.....      | 6,846        |
| Martinez Mesa.....                             | Wheeler.....                 | 6,820        |
| Mason's Ranch.....                             | Wheeler.....                 | 4,771        |
| Maxwell.....                                   | A., T. & S. F. R. R.....     | 6,061        |
| Mescalero Agency.....                          | Wheeler.....                 | 6,475        |
| Mesquite.....                                  | A., T. & S. F. R. R.....     | 3,815        |
| Mesteñito Ranch.....                           | Wheeler.....                 | 6,268        |
| Mesteño.....                                   | Wheeler.....                 | 6,399        |
| Miembres.....                                  | Wheeler.....                 | 4,920        |
| Miembres Forks.....                            | Wheeler.....                 | 7,563        |
| Miembres Mountains.....                        | Wheeler.....                 | 10,061       |
| Miembres Settlement.....                       | Wheeler.....                 | 5,007        |
| Moolen Peak.....                               | King.....                    | 7,339        |
| Monero.....                                    | D. & R. G. R. R.....         | 7,256        |
| Monica Spring.....                             | Wheeler.....                 | 7,602        |
| Mora Cañon.....                                | Wheeler.....                 | 6,528        |
| Mosca Peak.....                                | Wheeler.....                 | 9,723        |
| Mound Spring.....                              | Wheeler.....                 | 4,336        |
| Mule Spring.....                               | Wheeler.....                 | 5,282        |
| Mule Springs, 5 miles W. of Macho Springs..... | Wheeler.....                 | 5,652        |
| Mulligan's.....                                | Wheeler.....                 | 6,912        |
| Murphy's Ranch, Carrizozo Spring.....          | Wheeler.....                 | 5,300        |
| Nacimiento.....                                | Wheeler.....                 | 7,300        |
| Nacimiento Peak.....                           | Wheeler.....                 | 10,045       |
| Nambe Pueblo.....                              | Wheeler.....                 | 6,045        |
| Neides Spring.....                             | Mexican Boundary Survey..... | 4,310        |
| New Placer.....                                | Wheeler.....                 | 6,667        |
| New York Mountain.....                         | Wheeler.....                 | 10,594       |
| Nigger Head Spring.....                        | Wheeler.....                 | 4,861        |
| No Agua.....                                   | D. & R. G. R. R.....         | 8,183        |
| Nogal Peak.....                                | Wheeler.....                 | 9,963        |
| North Franklin Peak.....                       | Wheeler.....                 | 7,070        |
| Nutria.....                                    | Wheeler.....                 | 6,901        |
| Nutria Spring.....                             | Wheeler.....                 | 6,934        |
| Nutrites Plaza.....                            | Wheeler.....                 | 7,455        |
| Nutt.....                                      | A., T. & S. F. R. R.....     | 4,689        |
| Oak Spring.....                                | Wheeler.....                 | 5,243        |
| Oak Spring Encinosa.....                       | Wheeler.....                 | 7,204        |
| Ocate.....                                     | .....                        | 5,922        |
| Ocate Crater.....                              | Wheeler.....                 | 8,903        |
| Ojitos de las Cuevas.....                      | Wheeler.....                 | 5,902        |
| Ojo Amarillo.....                              | Wheeler.....                 | 6,384        |

| Station.                   | Authority.                   | Elevat. in Feet. |
|----------------------------|------------------------------|------------------|
| Ojo Caliente.....          | Wheeler.....                 | 6,289            |
| Ojo Chameleon.....         | Wheeler.....                 | 6,440            |
| Ojo Datil.....             | Wheeler.....                 | 7,411            |
| Ojo de Estancia.....       | Wheeler.....                 | 6,171            |
| Ojo de Inez.....           | Mexican Boundary Survey..... | 5,228            |
| Ojo de Judio.....          | Wheeler.....                 | 9,228            |
| Ojo de la Casa.....        | Wheeler.....                 | 6,228            |
| Ojo de la Culebra.....     | Wheeler.....                 | 5,728            |
| Ojo del Alto Peak.....     | Wheeler.....                 | 6,228            |
| Ojo de la Parida.....      | Wheeler.....                 | 4,228            |
| Ojo de la Quinca.....      | Wheeler.....                 | 5,628            |
| Ojo de las Cañas.....      | Wheeler.....                 | 5,128            |
| Ojo de la Tunisa.....      | Wheeler.....                 | 5,67             |
| Ojo del Cibolo.....        | Wheeler.....                 | 5,64             |
| Ojo del Indio.....         | Wheeler.....                 | 9,28             |
| Ojo de los Cazos.....      | Wheeler.....                 | 7,61             |
| Ojo del Oso.....           | Wheeler.....                 | 7,78             |
| Ojo de los Valles.....     | Wheeler.....                 | 6,979            |
| Ojo del Perro.....         | Mexican Boundary Survey..... | 4,692            |
| Ojo del Pescado.....       | Pac. R. R. Reports.....      | 6,551            |
| Ojo de Nuestra Señora..... | Wheeler.....                 | 6,606            |
| Ojo de Vaca.....           | Wheeler.....                 | 6,864            |
| Ojo de Vaca.....           | Mexican Boundary Survey..... | 4,980            |
| Ojo Galle.....             | Wheeler.....                 | 7,943            |
| Ojo Milagro.....           | Wheeler.....                 | 5,173            |
| Ojos Calientes.....        | Wheeler.....                 | 5,694            |
| Onava.....                 | A., T. & S. F. R. R.....     | 6,728            |
| Ord Peak.....              | Wheeler.....                 | 10,094           |
| Organ Mountain.....        | Wheeler (Theod.).....        | 9,108            |
| Organ Mountain Pass.....   | P. R. R. Reports.....        | 5,467            |
| Ortiz.....                 | A., T. & S. F. R. R.....     | 5,819            |
| Oscura Water Holes.....    | Wheeler.....                 | 5,461            |
| Osha Peak.....             | Wheeler.....                 | 10,083           |
| Oteio.....                 | A., T. & S. F. R. R.....     | 6,377            |
| Pajarida.....              | .....                        | 4,833            |
| Palmillo.....              | D. & R. G. R. R.....         | 8,236            |
| Palomas.....               | Wheeler.....                 | 4,127            |
| Paraje.....                | Wheeler.....                 | 4,319            |
| Paria Spring.....          | Wheeler.....                 | 6,696            |
| Parida.....                | Wheeler.....                 | 4,627            |
| Pastora.....               | Hayden.....                  | 9,332            |
| Patero.....                | Wheeler.....                 | 6,123            |
| Patterson's Ranch.....     | Wheeler.....                 | 4,690            |
| Payanda.....               | Toner.....                   | 4,833            |
| Pecos Village.....         | Emory.....                   | 6,366            |
| Pedernal.....              | Wheeler.....                 | 7,140            |
| Pedernal Pass.....         | Wheeler.....                 | 7,181            |
| Pedernal Peak.....         | Wheeler.....                 | 7,580            |
| Pedernal Water Hole.....   | Wheeler.....                 | 7,140            |
| Pelado Peak.....           | Wheeler.....                 | 11,260           |
| Peloncillo Pass.....       | T. & P. R. R. Surveys.....   | 4,446            |
| Peña Blanca.....           | Wheeler.....                 | 5,170            |
| Peñasco.....               | Wheeler.....                 | 7,452            |
| Peralta.....               | Wheeler.....                 | 4,661            |
| Pescado Spring.....        | Wheeler.....                 | 6,546            |
| Picacho Crossing.....      | Wheeler.....                 | 3,784            |
| Picacho de Sabinal.....    | Wheeler.....                 | 4,676            |
| Picacho Peak.....          | Wheeler.....                 | 4,825            |
| Picuris Pueblo.....        | Wheeler.....                 | 7,108            |
| Pinos Altos.....           | Wheeler.....                 | 6,845            |
| Pinos Altos Peak.....      | Wheeler.....                 | 8,128            |
| Pintado Pueblo.....        | Wheeler.....                 | 6,606            |
| Placer Mountain.....       | Wheeler.....                 | 8,927            |
| Plaza de Alcalde.....      | Wheeler.....                 | 5,766            |

| Station.                           | Authority.                  | Elevation.   |
|------------------------------------|-----------------------------|--------------|
|                                    |                             | <i>Feet.</i> |
| Plaza Mangos .....                 | Wheeler .....               | 7,319        |
| Point of Rocks .....               | Wheeler .....               | 4,268        |
| Pojoaque .....                     | Wheeler .....               | 5,750        |
| Polvadero Peak .....               | Wheeler .....               | 7,324        |
| Ponil Pass .....                   | Wheeler .....               | 9,848        |
| Pope .....                         | A., T. & S. F. R. R. ....   | 4,557        |
| Posos del Pino .....               | Wheeler .....               | 6,055        |
| Pueblo Colorado .....              | Wheeler .....               | 6,368        |
| Pueblo Springs .....               | Wheeler .....               | 6,363        |
| Safford P. O. ....                 | Wheeler .....               | 2,712        |
| Puercito .....                     | Wheeler .....               | 6,847        |
| Puertocito .....                   | Wheeler .....               | 6,428        |
| Puertocito Spring .....            | Wheeler .....               | 6,499        |
| Punta del Agua .....               | Wheeler .....               | 6,599        |
| Pyramid .....                      | S. P. R. R. ....            | 4,303        |
| Pyramid Hill .....                 | Wheeler .....               | 6,628        |
| Queletes .....                     | .....                       | 5,193        |
| Ralston .....                      | Wheeler .....               | 4,488        |
| Rancheria Viega .....              | Wheeler .....               | 7,300        |
| Ranchos de Taos .....              | Wheeler .....               | 6,963        |
| Randall .....                      | A., T. & S. F. R. R. ....   | 3,947        |
| Raton .....                        | A., T. & S. F. R. R. ....   | 6,620        |
| Rattlesnake Hill .....             | Wheeler .....               | 6,617        |
| Rayado .....                       | .....                       | 6,946        |
| Real Dolores .....                 | Wheeler .....               | 6,802        |
| Recas .....                        | A., T. & S. F. R. R. ....   | 7,049        |
| Remances .....                     | Toner .....                 | 6,186        |
| Rincon .....                       | A., T. & S. F. R. R. ....   | 4,014        |
| Rinconada .....                    | Wheeler .....               | 5,829        |
| Rio Puerco .....                   | A. & P. R. R. ....          | 5,026        |
| Rito Mangos .....                  | Wheeler .....               | 7,319        |
| Rito Quemado .....                 | Wheeler .....               | 6,827        |
| Roblado Peak .....                 | Wheeler .....               | 5,575        |
| Rock Ranch .....                   | Wheeler .....               | 5,844        |
| Romero .....                       | A., T. & S. F. R. R. ....   | 6,226        |
| Rock Spring .....                  | Wheeler .....               | 6,849        |
| Rogers .....                       | S. P. R. R. ....            | 3,730        |
| Rosario .....                      | A., T. & S. F. R. R. ....   | 5,400        |
| Sabinal .....                      | A., T. & S. F. R. R. ....   | 4,741        |
| Do .....                           | Wheeler .....               | 5,037        |
| Sabinal Agency .....               | Wheeler .....               | 4,757        |
| Salado .....                       | Wheeler .....               | 6,321        |
| Salinas Peak .....                 | Wheeler .....               | 9,040        |
| San Antonio .....                  | A., T. & S. F. R. R. ....   | 4,517        |
| Do .....                           | Pacific R. R. Reports ..... | 6,409        |
| Do .....                           | Wheeler .....               | 5,625        |
| San Antonio Peak .....             | Wheeler .....               | 10,912       |
| Do .....                           | Hayden .....                | 10,833       |
| San Antonio Valley .....           | Wheeler .....               | 8,367        |
| San Augustine .....                | Wheeler .....               | 6,002        |
| San Augustine Pass .....           | Wheeler .....               | 5,654        |
| San Augustine Plain .....          | Wheeler .....               | 6,780        |
| Sanchez Ranch .....                | Wheeler .....               | 7,298        |
| Sandia Mountains, summit of .....  | Wheeler .....               | 10,609       |
| San Domingo .....                  | .....                       | 5,190        |
| San Felipe .....                   | Wheeler .....               | 5,007        |
| San Francisco (upper) plaza .....  | Wheeler .....               | 5,688        |
| Do .....                           | Wheeler .....               | 5,638        |
| Do .....                           | Wheeler .....               | 5,639        |
| San Francisco, on Rio Puerco ..... | Wheeler .....               | 5,444        |
| San Geronimo .....                 | Wheeler .....               | 6,724        |
| San Ignacio .....                  | Wheeler .....               | 5,515        |
| San Ildefonso .....                | Wheeler .....               | 5,457        |
| San Isidro .....                   | Wheeler .....               | 5,460        |

| Station.                            | Authority.               | Elevation.   |
|-------------------------------------|--------------------------|--------------|
|                                     |                          | <i>Feet.</i> |
| San José.....                       | A. & P. R. R.....        | 5,428        |
| Do.....                             | Wheeler.....             | 5,648        |
| San Juan.....                       | Wheeler.....             | 5,601        |
| Do... Pueblo.....                   | Wheeler.....             | 5,554        |
| San Lorenzo.....                    | Wheeler.....             | 6,107        |
| San Lorenzo Spring.....             | Wheeler.....             | 5,326        |
| San Luis Rey.....                   | Wheeler.....             | 5,152        |
| San Marcial.....                    | A., T. & S. F. R. R..... | 4,437        |
| Do.....                             | Wheeler.....             | 4,385        |
| San Marcos Spring.....              | Wheeler.....             | 6,056        |
| San Mateo.....                      | Wheeler.....             | 7,323        |
| San Mateo Mountain.....             | Wheeler.....             | 10,209       |
| San Miguel.....                     | A., T. & S. F. R. R..... | 6,019        |
| Sands.....                          | A., T. & S. F. R. R..... | 6,386        |
| San Nicolas Spring.....             | Wheeler.....             | 4,218        |
| San Pedro.....                      | Wheeler.....             | 4,488        |
| San Rafael.....                     | Wheeler.....             | 6,509        |
| Santa Ana.....                      | Wheeler.....             | 5,346        |
| Santa Clara.....                    |                          | 6,511        |
| Santa Clara Mountain.....           | Wheeler (Theod.).....    | 11,507       |
| Santa Cruz.....                     | Wheeler.....             | 5,590        |
| Santa Fé.....                       | Wheeler.....             | 7,047        |
| Do.....                             | A., T. & S. F. R. R..... | 6,937        |
| Do... Signal Station.....           | U. S. Signal Office..... | 6,862        |
| Santa Fé Baldy Peak.....            | Wheeler.....             | 12,661       |
| Santa Rita.....                     | Wheeler.....             | 6,161        |
| Santa Rita Copper Mines.....        | Wheeler.....             | 6,161        |
| Santa Rita del Cobre.....           | Mexican Boundary.....    | 6,106        |
| Santo Domingo.....                  | Wheeler.....             | 5,110        |
| Santo Niño del Rincon.....          | Wheeler.....             | 7,418        |
| Sapello.....                        | Wheeler.....             | 6,876        |
| Sayer's Bench.....                  | Wheeler.....             | 6,694        |
| Sayer's Ranch.....                  | Wheeler.....             | 6,694        |
| Selden, Fort.....                   | Wheeler.....             | 3,900        |
| Do.....                             | A., T. & S. F. R. R..... | 3,937        |
| Sellers.....                        | A., T. & S. F. R. R..... | 4,495        |
| Servilleta.....                     | Wheeler.....             | 6,745        |
| Do.....                             | D. & R. G. R. R.....     | 7,706        |
| Shedd's Ranch, San Augustin.....    | Wheeler.....             | 4,378        |
| Sheep Springs.....                  | Toner.....               | 5,310        |
| Sherman, Camp (old).....            | Wheeler.....             | 6,927        |
| Shoemaker.....                      | A., T. & S. F. R. R..... | 6,254        |
| Silla.....                          | A., T. & S. F. R. R..... | 6,677        |
| Silver City.....                    | A., T. & S. F. R. R..... | 5,771        |
| Do... Signal Station.....           | U. S. Signal Office..... | 5,796        |
| Silver Springs.....                 | Wheeler.....             | 7,638        |
| Slocum.....                         | Wheeler.....             | 4,519        |
| Socorro.....                        | A., T. & S. F. R. R..... | 4,565        |
| Do.....                             | Wheeler.....             | 4,659        |
| Do.....                             | Med. Dept., U. S. A..... | 4,560        |
| Do... Signal Station.....           | U. S. Signal Office..... | 4,565        |
| Socorro Ford.....                   | Wheeler.....             | 4,534        |
| Socorro Peak.....                   | Wheeler.....             | 7,281        |
| South Florida Peak.....             | Wheeler.....             | 7,261        |
| South Oscura Mountain.....          | Wheeler.....             | 8,732        |
| South Sandia Peak.....              | Wheeler.....             | 8,567        |
| Springer.....                       | A., T. & S. F. R. R..... | 5,766        |
| Stanton, Fort (flagstaff).....      | Wheeler.....             | 6,151        |
| Stinking Springs.....               | Wheeler.....             | 6,249        |
| Stone Ranch, on Canadian River..... | Wheeler.....             | 5,844        |
| Strauss.....                        | S. P. R. R.....          | 4,085        |
| Sublette.....                       | D. & R. G. R. R.....     | 9,215        |
| Sulzbacher.....                     | A., T. & S. F. R. R..... | 5,973        |
| Suna.....                           | A. & P. R. R.....        | 5,264        |

| Station.               | Authority.                | Elevation.   |
|------------------------|---------------------------|--------------|
|                        |                           | <i>Feet.</i> |
| Peak .....             | Wheeler .....             | 6,030        |
| Water Spring .....     | Wheeler .....             | 6,343        |
| s de Canoficito .....  | Wheeler .....             | 5,083        |
| s de las Animas .....  | Wheeler .....             | 6,404        |
| .....                  | Wheeler .....             | 6,983        |
| .....                  | Wheeler .....             | 9,282        |
| ak .....               | Wheeler .....             | 13,145       |
| aza .....              | Wheeler .....             | 6,949        |
| tas .....              | Wheeler .....             | 8,870        |
| Mount .....            | Wheeler .....             | 11,391       |
| Ranch .....            | Wheeler .....             | 7,226        |
| .....                  | Wheeler .....             | 6,668        |
| .....                  | A., T. & S. F. R. R. .... | 5,844        |
| Peak .....             | Wheeler .....             | 7,060        |
| Mount .....            | Wheeler .....             | 11,275       |
| on's Spring .....      | Wheeler .....             | 7,607        |
| Port .....             | Med. Dept. U. S. A. ....  | 4,500        |
| Peak .....             | Wheeler .....             | 9,122        |
| marilla .....          | Wheeler .....             | 7,466        |
| .....                  | Wheeler .....             | 6,214        |
| .....                  | A., T. & S. F. R. R. .... | 6,363        |
| te .....               | Wheeler .....             | 6,506        |
| .....                  | A. & P. R. R. ....        | 9,443        |
| ños Water Holes .....  | Wheeler .....             | 5,502        |
| .....                  | Wheeler .....             | 4,879        |
| Springs .....          | Wheeler .....             | 5,980        |
| .....                  | A., T. & S. F. R. R. .... | 3,975        |
| ts Ranch .....         | Wheeler .....             | 4,634        |
| ros Spring .....       | Wheeler .....             | 6,128        |
| rmanos Peak .....      | Wheeler .....             | 7,151        |
| dras .....             | D. & R. G. R. R. ....     | 8,066        |
| d .....                | .....                     | 5,725        |
| .....                  | Wheeler .....             | 4,347        |
| .....                  | Wheeler .....             | 7,622        |
| Peak .....             | Wheeler .....             | 13,150       |
| a .....                | Wheeler .....             | 4,344        |
| a, Fort (old) .....    | Wheeler .....             | 6,740        |
| ring .....             | Wheeler .....             | 5,925        |
| Mesa .....             | Wheeler .....             | 5,510        |
| .....                  | S. P. R. R. ....          | 4,424        |
| Fort .....             | Wheeler .....             | 6,711        |
| .....                  | Med. Dept. U. S. A. ....  | 6,670        |
| States Mountain .....  | Med. Dept. U. S. A. ....  | 10,734       |
| .....                  | A., T. & S. F. R. R. .... | 4,537        |
| abo Pass .....         | Wheeler .....             | 6,431        |
| ak .....               | Wheeler .....             | 10,151       |
| a .....                | Wheeler .....             | 4,980        |
| le .....               | A., T. & S. F. R. R. .... | 4,469        |
| ummer .....            | Wheeler .....             | 8,557        |
| Village .....          | Emory .....               | 6,418        |
| Spring .....           | Wheeler .....             | 5,982        |
| .....                  | Wheeler .....             | 7,823        |
| Springs .....          | Emory .....               | 6,299        |
| , Camp .....           | Wheeler .....             | 6,188        |
| .....                  | D. & R. G. R. R. ....     | 8,465        |
| er Spring .....        | Wheeler .....             | 7,106        |
| Mound .....            | A., T. & S. F. R. R. .... | 6,176        |
| .....                  | A., T. & S. F. R. R. .... | 5,604        |
| .....                  | A., T. & S. F. R. R. .... | 5,246        |
| Springs .....          | Wheeler .....             | 5,008        |
| us .....               | A., T. & S. F. R. R. .... | 6,396        |
| .....                  | A., T. & S. F. R. R. .... | 4,493        |
| r, Fort .....          | Med. Dept. U. S. A. ....  | 6,350        |
| allinas Mountain ..... | Wheeler .....             | 8,464        |



| Station.                                  | Authority.                       | Elevation.   |
|-------------------------------------------|----------------------------------|--------------|
|                                           |                                  | <i>Feet.</i> |
| West Jicarilla Cone .....                 | Wheeler.....                     | 7,727        |
| Whetstone .....                           | Toner .....                      | 6,360        |
| White Oak Spring.....                     | Wheeler.....                     | 6,618        |
| White Sands .....                         | Wheeler.....                     | 3,899        |
| Willow Creek .....                        | D. & R. G. R. R.....             | 7,720        |
| Willow Spring .....                       | Wheeler.....                     | 6,677        |
| Wilna .....                               | S. P. R. R.....                  | 4,559        |
| Wingate .....                             | A. & P. R. R.....                | 6,714        |
| Wingate, Fort .....                       | Wheeler.....                     | 7,038        |
| Do.....Sun Dial .....                     | U. S. Geol. Survey (levels)..... | 6,997        |
| Winter Spring.....                        | Wheeler.....                     | 7,182        |
| Winter's Ranch, Jicarilla Mountains ..... | Wheeler.....                     | 6,542        |
| Yucca, Camp.....                          | Wheeler.....                     | 4,374        |
| Zandia.....                               | Toner .....                      | 5,056        |
| Zuni .....                                | Toner .....                      | 6,355        |
| Do.....                                   | S. P. R. R.....                  | 4,189        |
| Do, old.....                              | .....                            | 7,414        |
| Zuni Pass .....                           | K. P. R. R. Surveys.....         | 7,926        |

# NEW YORK.

| Station.                               | Authority.                   | Elevation.   |
|----------------------------------------|------------------------------|--------------|
|                                        |                              | <i>Feet.</i> |
| Acra (Catskills) .....                 | Appal. Club .....            | 546          |
| Adams .....                            | R., W. & O. R. R. ....       | 599          |
| Do. Centre .....                       | R., W. & O. R. R. ....       | 619          |
| Adamsville .....                       | A. & S. R. R. ....           | 212          |
| Addison .....                          | N. Y., L. E. & W. R. R. .... | 993          |
| Adrian .....                           | N. Y., L. E. & W. R. R. .... | 1,112        |
| Afton .....                            | A. & S. R. R. ....           | 979          |
| Akron .....                            | N. Y. C. & H. R. R. R. ....  | 765          |
| Albany .....                           | N. Y. C. & H. R. R. R. ....  | 30           |
| Do. ....                               | A. & S. R. R. ....           | 16           |
| Do. Water Table .....                  | N. Y. C. & H. R. R. R. ....  | 32           |
| Do. Signal Station .....               | U. S. Signal Office .....    | 75           |
| Do. M. T. Hudson River .....           | U. S. C. & G. S. ....        | 6            |
| Albion .....                           | N. Y., C. & H. R. R. ....    | 547          |
| Do. Geodetic Station .....             | U. S. Lake Survey .....      | 711          |
| Alden .....                            | N. Y., L. E. & W. R. R. .... | 864          |
| Alexander .....                        | N. Y., L. E. & W. R. R. .... | 938          |
| Alfred .....                           | N. Y., L. E. & W. R. R. .... | 1,660        |
| Allegany .....                         | N. Y., L. E. & W. R. R. .... | 1,422        |
| Allis, Geodetic Station .....          | N. Y. State Survey .....     | 503          |
| Almond .....                           | N. Y., L. E. & W. R. R. .... | 1,410        |
| Amawalk .....                          | N. Y. & N. R. R. ....        | 384          |
| Amboy Station .....                    | N. Y. State Survey .....     | 793          |
| Amherst, Geodetic Station .....        | U. S. Lake Survey .....      | 260          |
| Amersand Pond .....                    | Geol. Survey of N. Y. ....   | 2,079        |
| Amsterdam .....                        | N. Y. C. & H. R. R. R. ....  | 279          |
| Ancram Lead Mines .....                | P. H. & B. R. R. ....        | 570          |
| Andover .....                          | N. Y., L. E. & W. R. R. .... | 1,640        |
| Andrew Mountain .....                  | Adirondack Survey .....      | 3,216        |
| Angelic .....                          | R. N. & P. R. R. ....        | 1,455        |
| Angola .....                           | L. S. & M. S. R. R. ....     | 687          |
| Antrim .....                           | C., C. & A. R. R. ....       | 1,672        |
| Apersand Mountain .....                | Adirondack Survey .....      | 3,433        |
| Apulia .....                           | S. & B. R. R. ....           | 1,227        |
| Arcade .....                           | B., N. Y. & P. R. R. ....    | 1,457        |
| Arkport .....                          | N. Y., L. E. & W. R. R. .... | 1,199        |
| Arkville .....                         | U. & D. R. R. ....           | 1,342        |
| Ashford .....                          | N. Y. & N. R. R. ....        | 139          |
| Ashland Centre P. O. (Catskills) ..... | Appal. Club .....            | 1,435        |
| Ashland Pinnacle (Catskills) .....     | Appal. Club .....            | 3,420        |
| Attaban .....                          | M., D. & C. R. R. ....       | 451          |
| Attica .....                           | N. Y., L. E. & W. R. R. .... | 998          |
| Attica Summit .....                    | N. Y., L. E. & W. R. R. .... | 1,086        |
| Atwater .....                          | G., I. & S. R. R. ....       | 394          |
| Auburn .....                           | N. Y. C. & H. R. R. R. ....  | 674          |
| Do. ....                               | Southern Cent. R. R. ....    | 666          |
| Do. ....                               | I., A. & W. R. R. ....       | 639          |
| Do. City datum .....                   | City Engineer .....          | 673          |
| Aurora .....                           | B., N. Y. & P. R. R. ....    | 925          |
| Au Sable Pond .....                    | Geol. Survey of N. Y. ....   | 2,065        |
| Authorsburg .....                      | N., D. & C. R. R. ....       | 337          |
| Avalanche Lake (Adirondacks) .....     | Adirondack Survey .....      | 2,846        |
| Do. ....                               | Geol. Survey of N. Y. ....   | 2,856        |
| Avoca .....                            | N. Y., L. E. & W. R. R. .... | 1,198        |
| Avon .....                             | N. Y., L. E. & W. R. R. .... | 585          |
| Bainbridge .....                       | A. & S. R. R. ....           | 994          |
| Baldface Mountain .....                | Adirondack Survey .....      | 3,904        |

| Station.                                   | Authority.                  | Elevation    |
|--------------------------------------------|-----------------------------|--------------|
|                                            |                             | <i>Feet.</i> |
| Bald Mountain.....                         | Adirondack Survey.....      | 2,300        |
| Bald Peak (Adirondacks).....               | Adirondack Survey.....      | 2,080        |
| Do.....                                    | Geol. Survey of N. Y.....   | 2,060        |
| Do... (Moriah).....                        | Adirondack Survey.....      | 2,120        |
| Baldwin Place.....                         | N. Y. & N. R. R.....        | 62           |
| Baldwinsville.....                         | O. & S. R. R.....           | 39           |
| Ballston.....                              | R. & S. R. R.....           | 31           |
| Balm of Gilead Mountain.....               | Adirondack Survey.....      | 1,960        |
| Balsam Mountain north end (Catskills)..... | Appal. Club.....            | 3,570        |
| Do..... south end (Catskills).....         | Appal. Club.....            | 3,600        |
| Barlow Hill (Catskills).....               | Appal. Club.....            | 2,660        |
| Bartlett.....                              | Rome & C. R. R.....         | 56           |
| Bartlett Mountain.....                     | Adirondack Survey.....      | 3,700        |
| Barton.....                                | N. Y., L. E. & W. R. R..... | 80           |
| Barto Geodetic Station.....                | N. Y. State Survey.....     | 1,600        |
| Basin Mountain.....                        | Adirondack Survey.....      | 4,900        |
| Basket.....                                | N. Y., L. E. & W. R. R..... | 80           |
| Batavia.....                               | N. Y. C. & H. R. R.....     | 80           |
| Do. Geodetic Station.....                  | U. S. Lake Survey.....      | 70           |
| Bath.....                                  | N. Y., L. E. & W. R. R..... | 1,100        |
| Beach, Lake.....                           | Geol. Survey of N. Y.....   | 1,900        |
| Bear-pen Mountain, approx.....             | Appal. Club.....            | 3,500        |
| Beaver Dam.....                            | N. Y., L. E. & W. R. R..... | 400          |
| Beaver Dams.....                           | S. G. & C. R. R.....        | 1,200        |
| Beaver Lake.....                           | Toner.....                  | 1,400        |
| Beaver Meadow Pond.....                    | Geol. Survey of N. Y.....   | 2,100        |
| Bedford.....                               | N. Y. & H. R. R.....        | 200          |
| Beech Ridge Gap.....                       | Appal. Club.....            | 3,000        |
| Bee Line Mountain, approx.....             | Appal. Club.....            | 3,300        |
| Belle Ayr Mountain.....                    | Appal. Club.....            | 3,300        |
| Bellona.....                               | N. C. R. R.....             | 1,000        |
| Belvedere.....                             | N. Y., L. E. & W. R. R..... | 1,300        |
| Bennet Notch.....                          | Appal. Club.....            | 1,000        |
| Bennett's Pond.....                        | Geol. Survey of N. Y.....   | 1,000        |
| Bergen.....                                | N. Y. C. & H. R. R.....     | 1,000        |
| Berkshire.....                             | S. C. R. R.....             | 1,000        |
| Bessemer.....                              | U., I. & E. R. R.....       | 2,000        |
| Best Hill.....                             | Appal. Club.....            | 2,000        |
| Bethel.....                                | U., D. & C. R. R.....       | 2,000        |
| Big Flats.....                             | N. Y., L. E. & W. R. R..... | 1,000        |
| Big Indian.....                            | U. & D. R. R.....           | 1,000        |
| Big Island.....                            | N. Y., L. E. & W. R. R..... | 3,000        |
| Big Westkill Mountain.....                 | Appal. Club.....            | 3,000        |
| Billings.....                              | U., D. & C. R. R.....       | 1,000        |
| Binghams.....                              | G., I. & S. R. R.....       | 1,000        |
| Binghamton.....                            | N. Y., L. E. & W. R.....    | 1,000        |
| Do.....                                    | Del., L. & W. R. R.....     | 1,000        |
| Do.....                                    | A. & S. R. R.....           | 1,000        |
| Do..... N. Y. & Erie Junction.....         | S. & B. R. R.....           | 1,000        |
| Bingley.....                               | C., C. & D. R. R.....       | 1,000        |
| Binnewater.....                            | W. V. R. R.....             | 1,000        |
| Birch Kill Notch.....                      | Appal. Club.....            | 2,000        |
| Birds and Worms.....                       | R. & L. O. R. R.....        | 4,000        |
| Black Dome.....                            | Appal. Club.....            | 3,000        |
| Black Head.....                            | Appal. Club.....            | 3,000        |
| Black River.....                           | U. & B. R. R.....           | 1,000        |
| Black Rock.....                            | N. Y. C. & H. R. R.....     | 1,000        |
| Blanteville.....                           | N. Y., L. E. & W. R. R..... | 1,000        |
| Blodgett Mills.....                        | S. & B. R. R.....           | 1,000        |
| Bloods.....                                | N. Y., L. E. & W. R. R..... | 1,000        |
| Blossburg.....                             | C., C. & A. R. R.....       | 1,000        |
| Blue Mountain.....                         | Adirondack Survey.....      | 1,000        |
| Blue Mountain Lake.....                    | Geol. Survey of N. Y.....   | 1,000        |

| Station.                                               | Authority.                  | Elevation.   |
|--------------------------------------------------------|-----------------------------|--------------|
|                                                        |                             | <i>Feet.</i> |
| Bog Lake.....                                          | Geol. Survey of N. Y.....   | 1,755        |
| Boiceville.....                                        | U. & D. R. R.....           | 604          |
| Booneville.....                                        | U. & B. R. R. R.....        | 1,135        |
| Boreas Mountain.....                                   | Geol. Survey of N. Y.....   | 3,726        |
| Boston Corner.....                                     | P., H. & B. R.....          | 738          |
| Bouchon.....                                           | N. Y., L. E. & W. R. R..... | 852          |
| Breesport.....                                         | U., I. & E. R. R.....       | 1,097        |
| Brewerton.....                                         | R., W. & O. R.....          | 384          |
| Brewster.....                                          | N. Y. & N. R. R.....        | 406          |
| Do.....                                                | N. Y. & H. R. R.....        | 414          |
| Bridgewater.....                                       | U. C. & S. R. R.....        | 1,188        |
| Brier Hill.....                                        | U. & B. R. R.....           | 276          |
| Brinckerhoff.....                                      | U., D. C. R. R.....         | 223          |
| Brockport.....                                         | N. Y. C. & H. R. R.....     | 546          |
| Do..... Geodetic Station.....                          | U. S. Lake Survey.....      | 731          |
| Brocton.....                                           | L., S. & M. S. R. R.....    | 689          |
| Brodhead's Bridge.....                                 | U. & D. R. R.....           | 504          |
| Broome Centre, Hotel.....                              | Appal. Club.....            | 1,973        |
| Brown's Station.....                                   | U. & D. R. R.....           | 530          |
| Bucktooth.....                                         | A. & G. W. R. R.....        | 1,376        |
| Buffalo.....                                           | N. Y., L. E. & W. R. R..... | 588          |
| Do..... Exchange street.....                           | N. Y. C. & H. R. R. R.....  | 584          |
| Do..... City Hall (ground), Geodetic Sta-<br>tion..... | U. S. Lake Survey.....      | 609          |
| Do..... Main street.....                               | N. Y., L. E. & W. R. R..... | 630          |
| Do..... Signal Station.....                            | U. S. Signal Office.....    | 664          |
| Buffalo Plains, Geodetic Station.....                  | U. S. Lake Survey.....      | 685          |
| Bulger, Geodetic Station.....                          | N. Y. State Survey.....     | 833          |
| Bulwaga Mountain.....                                  | Geol. Survey of N. Y.....   | 1,260        |
| Burns.....                                             | N. Y., L. E. & W. R. R..... | 1,203        |
| Burnt Mountain (Adirondacks).....                      | Adirondack Survey.....      | 2,085        |
| Do..... (Catskills).....                               | Appal. Club.....            | 3,170        |
| Byron.....                                             | N. Y. C. & H. R. R. R.....  | 695          |
| Cade Mountain (Catskills).....                         | Appal. Club.....            | 2,390        |
| Cadyville.....                                         | Chat. R. R.....             | 732          |
| Cairo (Catskills).....                                 | Appal. Club.....            | 346          |
| Caledonia.....                                         | N. Y. C. & H. R. R. R.....  | 658          |
| Do.....                                                | N. Y., L. E. & W. R. R..... | 667          |
| Callicoon.....                                         | N. Y., L. E. & W. R. R..... | 781          |
| Camden.....                                            | R. W. & O. R. R.....        | 520          |
| Camel's Hump.....                                      | Adirondack Survey.....      | 3,548        |
| Cameron.....                                           | N. Y., L. E. & W. R. R..... | 1,056        |
| Cameron Mills.....                                     | N. Y., L. E. & W. R. R..... | 1,029        |
| Campbell.....                                          | N. Y., L. E. & W. R. R..... | 1,014        |
| Campbell Hall.....                                     | N. Y., L. E. & W. R. R..... | 396          |
| Campville.....                                         | N. Y., L. E. & W. R. R..... | 830          |
| Canaan.....                                            | Boston & Albany R. R.....   | 869          |
| Canandaigua.....                                       | N. C. R. R.....             | 740          |
| Canaseraga.....                                        | N. Y. C. & H. R. R. R.....  | 418          |
| Canton.....                                            | N. Y., W. S. & B. R. R..... | 426          |
| Candor.....                                            | C. & L. R. R.....           | 822          |
| Canton.....                                            | N. Y., L. E. & W. R. R..... | 1,134        |
| Cape Vincent.....                                      | R. W. & O. R. R.....        | 253          |
| Carel.....                                             | N. Y. C. & N. R. R.....     | 519          |
| Canton line.....                                       | C. & S. R. R.....           | 968          |
| Canton, Geodetic Station.....                          | N. Y. State Survey.....     | 1,105        |
| Canton.....                                            | N. Y., L. E. & W. R. R..... | 1,399        |
| Canton.....                                            | U. & B. R. R. R.....        | 740          |
| Canton.....                                            | S. C. R. R.....             | 724          |
| Canton, surface of water.....                          | D., A. V. & P. R. R.....    | 1,309        |
| Canton.....                                            | U. C. & S. R. R.....        | 1,215        |
| Canton.....                                            | U. C. & S. R. R.....        | 1,179        |
| Canton.....                                            | N. Y., L. E. & W. R. R..... | 1,401        |
| Canton.....                                            | N. Y., L. E. & W. R. R..... | 1,431        |

| Station.                                            | Authority.                   | Elevation.   |
|-----------------------------------------------------|------------------------------|--------------|
|                                                     |                              | <i>Feet.</i> |
| Castleton .....                                     | U. S. C. & G. S. ....        | 19           |
| Do.. Boulder, corner Medder and River streets ..... | U. S. C. & G. S. ....        | 21           |
| Castor Land .....                                   | U. & B. R. R. R. ....        | 745          |
| Cato .....                                          | S. C. R. R. ....             | 423          |
| Catskill Lakes .....                                | Appal. Club .....            | 2, 140       |
| Catskill Mountain House .....                       | Appal. Club .....            | 2, 225       |
| Cattaraugus .....                                   | N. Y., L. E. & W. R. R. .... | 1, 411       |
| Cayuga .....                                        | N. Y. C. & H. R. R. R. ....  | 388          |
| Do.. Lake, 1878 .....                               | G. I. & S. R. R. ....        | 383          |
| Cazenovia .....                                     | C., C. & D. R. R. R. ....    | 1, 176       |
| Do .....                                            | S. & C. V. R. R. ....        | 1, 191       |
| Do.. Lake .....                                     | Toner .....                  | 900          |
| Cedar Lake .....                                    | Geol. Survey of N. Y. ....   | 2, 530       |
| Do .....                                            | Adirondack Survey .....      | 2, 493       |
| Cedar River Settlement .....                        | Adirondack Survey .....      | 1, 670       |
| Central Valley .....                                | N. Y., L. E. & W. R. R. .... | 476          |
| Centre .....                                        | N. Y. C. & H. R. R. R. ....  | 324          |
| Centreville .....                                   | A. & S. R. R. ....           | 964          |
| Chain Ponds .....                                   | Adirondack Survey .....      | 1, 707       |
| Champlain Lake .....                                | Adirondack Survey .....      | 91           |
| Do .....                                            | R. R. Reports .....          | 101          |
| Chapp, Geodetic Station .....                       | N. Y. State Survey .....     | 1, 280       |
| Charley Pond .....                                  | Adirondack Survey .....      | 1, 687       |
| Charlotte .....                                     | N. Y. C. & H. R. R. R. ....  | 255          |
| Charlotte Junction .....                            | N. Y. C. & H. R. R. R. ....  | 523          |
| Chataqua Lake .....                                 | Toner .....                  | 1, 291       |
| Chatham .....                                       | Boston & Albany R. R. ....   | 462          |
| Chatham Center .....                                | Boston & Albany R. R. ....   | 315          |
| Chaumont .....                                      | R., W. & O. R. R. ....       | 294          |
| Cheektowaga .....                                   | N. Y., L. E. & W. R. R. .... | 661          |
| Chemung .....                                       | N. Y., L. E. & W. R. R. .... | 817          |
| Chemung Junction .....                              | U., I. & E. R. R. ....       | 902          |
| Chenango Forks .....                                | U., C. & S. R. R. ....       | 901          |
| Cherry Valley .....                                 | U. & S. R. R. ....           | 1, 321       |
| Chester .....                                       | N. Y., L. E. & W. R. R. .... | 459          |
| Chestnut Ridge, Geodetic Station .....              | N. Y. State Survey .....     | 498          |
| Chicago .....                                       | U., I. & E. R. R. ....       | 1, 169       |
| Chittenango .....                                   | N. Y. C. & H. R. R. R. ....  | 417          |
| Chittenango Falls .....                             | C., C. & De R. R. R. ....    | 1, 051       |
| Churchville .....                                   | N. Y. C. & H. R. R. R. ....  | 570          |
| Clarence Centre .....                               | N. Y. C. & H. R. R. R. ....  | 643          |
| Clark's Mills .....                                 | Rome & C. R. R. ....         | 528          |
| Clayton .....                                       | U. & B. R. R. R. ....        | 232          |
| Clear Lake .....                                    | Geol. Survey of N. Y. ....   | 2, 006       |
| Clear Pond .....                                    | Adirondack Survey .....      | 1, 655       |
| Cleveland .....                                     | N. Y. & O. R. R. ....        | 418          |
| Clinton .....                                       | Rome & C. R. R. ....         | 583          |
| Clinton Corners .....                               | P., H. & B. R. R. ....       | 268          |
| Clockville .....                                    | C., C. & De R. R. R. ....    | 637          |
| Clove Branch Junction .....                         | N., D. & C. R. R. ....       | 269          |
| Clum Hill (Catskills) .....                         | Appal. Club .....            | 2, 372       |
| Clyde .....                                         | N. Y. C. & H. R. R. R. ....  | 396          |
| Do.. Geodetic Station .....                         | U. S. Lake Survey .....      | 642          |
| Clyde, Geodetic Station .....                       | N. Y. State Survey .....     | 633          |
| Clymer .....                                        | B. C. & P. R. R. ....        | 1, 146       |
| Cobble Hill .....                                   | Adirondack Survey .....      | 1, 936       |
| Cobleskill .....                                    | A. & S. R. R. ....           | 903          |
| Cochecton .....                                     | N. Y., L. E. & W. R. R. .... | 748          |
| Coffus .....                                        | N. D. & C. R. R. ....        | 659          |
| Colden, Lake .....                                  | Adirondack Survey .....      | 2, 748       |
| Do .....                                            | Guyot .....                  | 2, 786       |
| Colden Mountain .....                               | Adirondack Survey .....      | 4, 708       |
| Collamer, Geodetic Station .....                    | N. Y. State Survey .....     | 485          |

| Station.                             | Authority.                  | Elevation.   |
|--------------------------------------|-----------------------------|--------------|
|                                      |                             | <i>Feet.</i> |
| l's Chair, highest (Catskill's)..... | A. & S. R. R.....           | 1,118        |
| bus Summit.....                      | Appal. Club.....            | 3,165        |
| , Lake.....                          | N. Y., K. & S. R. R.....    | 1,553        |
| .....                                | Geol. Survey of N. Y.....   | 1,991        |
| .....                                | Adirondack Survey.....      | 4,142        |
| .....                                | N. Y., L. E. & W. R. R..... | 1,280        |
| ango Creek.....                      | B. & S. W. R. R.....        | 1,270        |
| .....                                | Del., L. & W. R. R.....     | 852          |
| aut, Geodetic Station.....           | U. S. Lake Survey.....      | 892          |
| ourg (Catskill).....                 | Appal. Club.....            | 756          |
| .....                                | N. Y., L. E. & W. R. R..... | 970          |
| tsville.....                         | Del., L. & W. R. R.....     | 855          |
| .....                                | N. Y., C. & H. R. R. R..... | 863          |
| l Mountain (Catskills).....          | Appal. Club.....            | 3,681        |
| g.....                               | N. Y., L. E. & W. R. R..... | 942          |
| all.....                             | N. Y., L. E. & W. R. R..... | 280          |
| allville (Catskills).....            | Appal. Club.....            | 950          |
| ad.....                              | U., I. & E. R. R.....       | 1,116        |
| , Geodetic Station.....              | N. Y. State Survey.....     | 1,020        |
| .....                                | G. I. & S. R. R.....        | 853          |
| .....                                | N. Y. C. & N. R. R.....     | 452          |
| ille.....                            | N. Y., L. E. & W. R. R..... | 455          |
| Mills.....                           | C. C. & De R. R. R.....     | 1,172        |
| Mountain.....                        | Adirondack Survey.....      | 3,253        |
| .....                                | Adirondack Survey.....      | 3,289        |
| erry Creek.....                      | F. J. & G. R. R.....        | 759          |
| erry Lake.....                       | Toner.....                  | 1,570        |
| s Village.....                       | N. Y. C. & H. R. R. R.....  | 270          |
| n, Geodetic Station.....             | N. Y. State Survey.....     | 1,321        |
| iden.....                            | N. Y. C. & H. R. R. R.....  | 848          |
| d Lake.....                          | Geol. Survey of N. Y.....   | 2,022        |
| Falls.....                           | N. Y. & H. R. R.....        | 356          |
| Lake.....                            | N. Y., B. & M. R. R.....    | 167          |
| l Lake.....                          | Geol. Survey of N. Y.....   | 1,663        |
| Summit.....                          | N. Y., L. E. & W. R. R..... | 1,542        |
| ota, Geodetic Station.....           | N. Y., L. E. & W. R. R..... | 1,698        |
| .....                                | N. Y. State Survey.....     | 588          |
| .....                                | N. Y., L. E. & W. R. R..... | 997          |
| .....                                | C. C. & De R. R. R.....     | 1,225        |
| ville.....                           | N. Y., L. E. & W. R. R..... | 528          |
| .....                                | N. Y., L. E. & W. R. R..... | 1,190        |
| mora.....                            | Chat. R. R.....             | 1,356        |
| ille.....                            | N. Y., L. E. & W. R. R..... | 691          |
| .....                                | N. Y., L. E. & W. R. R..... | 1,024        |
| n, Geodetic Station.....             | N. Y. State Survey.....     | 631          |
| .....                                | N. Y., L. E. & W. R. R..... | 1,346        |
| ollow Mountain (Catskills).....      | Appal. Club.....            | 3,500        |
| ark Summit.....                      | N. Y., L. E. & W. R. R..... | 901          |
| Mountain (Catskills).....            | Appal. Club.....            | 2,540        |
| .....                                | C. C. & De R. R. R.....     | 1,309        |
| .....                                | N. Y., L. E. & W. R. R..... | 1,009        |
| ux, Geodetic Station.....            | N. Y. State Survey.....     | 832          |
| yster.....                           | C. C. & De R. R. R.....     | 1,276        |
| Ear Mountain.....                    | Adirondack Survey.....      | 3,904        |
| .....                                | N. Y. C. & H. R. R. R.....  | 417          |
| ... Centre.....                      | S. & C. V. R. R.....        | 410          |
| son.....                             | N. Y., L. E. & W. R. R..... | 954          |
| ery Mountain.....                    | Adirondack Survey.....      | 1,583        |
| ..... little.....                    | Adirondack Survey.....      | 1,376        |
| Peak.....                            | Adirondack Survey.....      | 4,916        |
| .....                                | Geol. Survey of N. Y.....   | 5,200        |
| Ferry.....                           | U. S. C. & G. S.....        | 12           |
| 's.....                              | S. & C. V. R. R.....        | 408          |
| top (Catskills).....                 | Appal. Club.....            | 3,875        |

| Station.                                                                  | Authority.                   | Elevation.   |
|---------------------------------------------------------------------------|------------------------------|--------------|
|                                                                           |                              | <i>Feet.</i> |
| Draper Geodetic Station.....                                              | N. Y. State Survey .....     | 653          |
| Dresden Station.....                                                      | S., G. & C. R. R. ....       | 515          |
| Dryden.....                                                               | S. C. R. R. ....             | 1,079        |
| Dryden Lake, surface water .....                                          | S. C. R. R. ....             | 1,160        |
| Duanesburg.....                                                           | A. & S. R. R. ....           | 793          |
| Duck Island, Geodetic Station .....                                       | U. S. Lake Survey .....      | 272          |
| Dundee.....                                                               | S., G. & C. R. R. ....       | 990          |
| Dunkirk, Union Depot .....                                                | L. S. & M. S. R. R. ....     | 598          |
| Do..... A. V. and P. R. R. crossing .....                                 | B. & S. W. R. R. ....        | 1,260        |
| Durham Centre (Catskills) .....                                           | Appal. Club .....            | 850          |
| Dutchess Junction .....                                                   | N., D. & C. R. R. ....       | 9            |
| Eagle Mountain (Catskills) .....                                          | N., D. & C. R. R. ....       | 3,560        |
| Eagle, Geodetic Station.....                                              | N. Y. State Survey .....     | 1,253        |
| Eagle Summit.....                                                         | R. & St. L. R. R. ....       | 1,916        |
| Earlville.....                                                            | U., C. & S. V. R. R. ....    | 1,125        |
| Do.....                                                                   | S. & C. V. R. R. ....        | 1,071        |
| East Albany.....                                                          | N. Y. C. & H. R. R. R. ....  | 23           |
| East Bloomfield.....                                                      | N. Y. C. & H. R. R. R. ....  | 833          |
| East Buffalo.....                                                         | N. Y., L. E. & W. R. R. .... | 607          |
| East Chatham.....                                                         | Boston & Albany R. R. ....   | 691          |
| East Clarion.....                                                         | N. Y., R. & P. R. R. ....    | 1,463        |
| East Creek.....                                                           | N. Y. C. & H. R. R. R. ....  | 334          |
| East Tarrytown.....                                                       | N. Y. C. & N. R. R. ....     | 305          |
| East Hill, Geodetic Station .....                                         | N. Y. State Survey .....     | 2,300        |
| East Homer.....                                                           | C., C. & De R. R. R. ....    | 1,135        |
| East Jewett (Catskills) .....                                             | Appal. Club .....            | 3,146        |
| East Kill Mountain (Catskills) .....                                      | Appal. Club .....            | 3,190        |
| East Pembroke.....                                                        | N. Y. C. & H. R. R. R. ....  | 885          |
| East River.....                                                           | C., C. & De R. R. R. ....    | 1,120        |
| East Sing Sing.....                                                       | N. Y. C. & N. R. R. ....     | 246          |
| East Waverly.....                                                         | G., I. & S. R. R. ....       | 806          |
| Eaton, Geodetic Station.....                                              | N. Y. State Survey .....     | 1,315        |
| Eaton.....                                                                | N. Y. & O. R. R. ....        | 1,227        |
| Ebenezer.....                                                             | B., N. Y. & P. R. R. ....    | 640          |
| Eckford Lake.....                                                         | Toner.....                   | 1,791        |
| Eden.....                                                                 | B. & S. W. R. R. ....        | 810          |
| Edwards.....                                                              | Boston & Albany R. R. ....   | 939          |
| Elk Lake.....                                                             | Geol. Survey of N. Y. ....   | 2,053        |
| Elkland.....                                                              | Corning, C. & A. R. R. ....  | 1,142        |
| Ellicottville.....                                                        | R. & S. L. R. R. ....        | 1,560        |
| Do..... water surface, Great Valley<br>Creek.....                         | R. & S. L. R. R. ....        | 1,548        |
| Elma.....                                                                 | B., N. Y. & P. R. R. ....    | 827          |
| Elmira.....                                                               | N. Y., L. E. & W. R. R. .... | 863          |
| Emmons.....                                                               | A. & S. R. R. ....           | 1,127        |
| Do..... Mount.....                                                        | Geol. Survey of N. Y. ....   | 1,000        |
| Do.....                                                                   | Adirondack Survey .....      | 3,586        |
| Ephrata, Geodetic Station.....                                            | N. Y. State Survey .....     | 1,029        |
| Erie, Lake, water surface.....                                            | U. S. Lake Survey .....      | 573          |
| Erieville.....                                                            | S. & C. V. R. R. ....        | 1,577        |
| Erin.....                                                                 | U., I. & E. R. R. ....       | 1,249        |
| Erwin Centre.....                                                         | Corning, C. & A. R. R. ....  | 976          |
| Erwin's.....                                                              | N. Y., L. E. & W. R. R. .... | 983          |
| Erwin's Mill.....                                                         | N. Y., L. E. & W. R. R. .... | 1,409        |
| Esperance.....                                                            | A. & S. R. R. ....           | 769          |
| Etna.....                                                                 | U., I. & E. R. R. ....       | 1,010        |
| Evergreen Mountain, approx. (Catskills) .....                             | Appal. Club .....            | 3,624        |
| Fabius, Geodetic Station.....                                             | N. Y. State Survey .....     | 2,020        |
| Failing, Geodetic Station.....                                            | N. Y. State Survey .....     | 821          |
| Fairfield Academy, R. R. bench at labora-<br>tory, Geodetic Station ..... | N. Y. State Survey .....     | 1,281        |
| Fair Ground.....                                                          | N. Y., L. E. & W. R. R. .... | 540          |
| Fairmount, Geodetic Station.....                                          | N. Y. State Survey .....     | 736          |

| Station.                     | Authority.                   | Elevation.   |
|------------------------------|------------------------------|--------------|
|                              |                              | <i>Feet.</i> |
| .....                        | N. Y. C. & H. R. R. R. ....  | 456          |
| .....                        | D., A. V. & P. R. R. ....    | 1,258        |
| letio Station.....           | U. S. Lake Survey .....      | 843          |
| .....                        | Corning, C. & A. R. R. ....  | 1,842        |
| .....                        | G., I. & S. R. R. ....       | 860          |
| .....                        | L. S. & M. S. R. R. ....     | 623          |
| .....                        | S. & C. V. R. R. ....        | 538          |
| .....                        | U. & B. R. R. R. ....        | 620          |
| etic Station .....           | N. Y. State Survey .....     | 1,862        |
| .....                        | D., A. V. & P. R. R. ....    | 1,243        |
| .....                        | N., D. & C. R. R. ....       | 213          |
| .....                        | S. C. R. R. ....             | 907          |
| .....                        | N. Y., L. E. & W. R. R. .... | 404          |
| .....                        | N. Y. C. & H. R. R. R. ....  | 299          |
| .....                        | N. Y., L. E. & W. R. R. .... | 883          |
| .....                        | Toner .....                  | 1,704        |
| .....                        | R. & S. R. R. ....           | 141          |
| .....                        | N. Y. C. & H. R. R. R. ....  | 311          |
| .....                        | U. S. C. & G. S. ....        | 9            |
| .....                        | U. & D. R. R. ....           | 1,004        |
| .....                        | N. Y. C. & H. R. R. R. ....  | 402          |
| .....                        | N. Y. & O. R. R. ....        | 1,764        |
| .....                        | Appal. Club .....            | 1,260        |
| .....                        | B., N. Y. & P. R. R. ....    | 1,593        |
| .....                        | D., A. V. & P. R. R. ....    | 765          |
| I. & E. R. R. crossing ..... | S. C. R. R. ....             | 1,049        |
| .....                        | D., A. V. & P. R. R. ....    | 1,261        |
| .....                        | N. Y., L. E. & W. R. R. .... | 1,539        |
| .....                        | O. & S. R. R. ....           | 387          |
| .....                        | Appal. Club .....            | 714          |
| .....                        | N. Y., L. E. & W. R. R. .... | 1,407        |
| .....                        | R. & S. L. R. R. ....        | 1,636        |
| .....                        | W. V. R. R. ....             | 311          |
| .....                        | N. Y., L. E. & W. R. R. .... | 1,283        |
| .....                        | N. Y. C. & H. R. R. R. ....  | 525          |
| etic Station .....           | U. S. Lake Survey .....      | 648          |
| .....                        | N. Y., L. E. & W. R. R. .... | 784          |
| .....                        | N. Y., L. E. & W. R. R. .... | 1,526        |
| ge .....                     | N. Y., L. E. & W. R. R. .... | 548          |
| ey Junction.....             | N. Y. C. & H. R. R. R. ....  | 543          |
| .....                        | N. Y., L. E. & W. R. R. .... | 600          |
| .....                        | N. Y. C. & H. R. R. R. ....  | 459          |
| .....                        | Toner .....                  | 324          |
| .....                        | S. & C. V. R. R. ....        | 1,450        |
| letio Station.....           | N. Y. State Survey .....     | 994          |
| Valley .....                 | Adirondack Survey .....      | 4,530        |
| Geodetic Station .....       | N. Y. State Survey .....     | 521          |
| (Catskills) .....            | Appal. Club .....            | 1,036        |
| ic Station .....             | N. Y. State Survey .....     | 1,265        |
| .....                        | U. & B. R. R. R. ....        | 780          |
| .....                        | N. Y., B. & M. R. R. ....    | 505          |
| .....                        | N., D. & C. R. R. ....       | 213          |
| .....                        | Adir. R. R. ....             | 712          |
| .....                        | F., J. & G. R. R. ....       | 800          |
| road (Catskills).....        | Appal. Club .....            | 2,504        |
| (Catskills) .....            | Appal. Club .....            | 2,629        |
| .....                        | N. Y., L. E. & W. R. R. .... | 431          |
| tain .....                   | Adirondack Survey .....      | 4,744        |
| .....                        | B. & S. W. R. R. ....        | 776          |
| ntain, Dry Brook .....       | Appal. Club .....            | 3,886        |
| .....                        | O. & S. R. R. ....           | 390          |
| .....                        | U. & D. R. R. ....           | 1,574        |
| leodetic Station.....        | N. Y. State Survey .....     | 420          |
| tain .....                   | Adirondack Survey .....      | 2,345        |

(333)



| Station.                                                     | Authority.                   | Elevation.   |
|--------------------------------------------------------------|------------------------------|--------------|
|                                                              |                              | <i>Fect.</i> |
| Gray Peak .....                                              | Adirondack Survey .....      | 4,984        |
| Great Bend .....                                             | U. & B. R. R. R. ....        | 649          |
| Great Valley .....                                           | N. Y., L. E. & W. R. R. .... | 1,393        |
| Greenbush .....                                              | U. S. C. & G. S. ....        | 26           |
| Do .....                                                     | N. Y. C. & H. R. R. R. ....  | 24           |
| Greene .....                                                 | U. C. & S. V. R. R. ....     | 916          |
| Greenfield .....                                             | Adirondack R. R. ....        | 564          |
| Green's Corners .....                                        | N. Y. C. & H. R. R. R. ....  | 466          |
| Green, Geodetic Station .....                                | N. Y. State Survey .....     | 974          |
| Greenwood .....                                              | N. Y., L. E. & W. R. R. .... | 520          |
| Grenadier, Geodetic Station .....                            | U. S. Lake Survey .....      | 268          |
| Grey Court .....                                             | N. Y., L. E. & W. R. R. .... | 432          |
| Griffin's Corners .....                                      | U. & D. R. R. ....           | 1,504        |
| Griswold's .....                                             | N. Y., L. E. & W. R. R. .... | 1,044        |
| Groton .....                                                 | S. C. R. R. ....             | 997          |
| Groveville .....                                             | N. D. & C. R. R. ....        | 177          |
| Guilderland .....                                            | A. & S. R. R. ....           | 329          |
| Guilford Junction, New Berlin R. R. ....                     | N. Y. & O. R. R. ....        | 1,063        |
| Gull Lake .....                                              | State Survey of N. Y. ....   | 2,019        |
| Hackensack River .....                                       | N. Y., L. E. & W. R. R. .... | 106          |
| Hadley .....                                                 | Adirondack R. R. ....        | 606          |
| Halcott Gap, summit road (Catskills) .....                   | Appal. Club .....            | 2,725        |
| Halcott Mountain (Catskills) .....                           | Appal. Club .....            | 3,504        |
| Halcottsville .....                                          | U. & D. R. R. ....           | 1,403        |
| Hale's Eddy .....                                            | N. Y., L. E. & W. R. R. .... | 980          |
| Hallenback, Geodetic Station .....                           | N. Y. State Survey .....     | 638          |
| Halsteads .....                                              | P., H. & B. R. R. ....       | 596          |
| Hamburg .....                                                | B. & S. W. R. R. ....        | 800          |
| Do... Geodetic Station .....                                 | U. S. Lake Survey .....      | 598          |
| Hamburg .....                                                | L. S. & M. S. R. R. ....     | 635          |
| Hamilton College, top of Chapel Dome, Geodetic Station ..... | N. Y. State Survey .....     | 1,004        |
| Hamilton's .....                                             | N. Y., L. E. & W. R. R. .... | 920          |
| Hamlin .....                                                 | R., W. & O. R. R. ....       | 310          |
| Hammond .....                                                | U. & B. R. R. R. ....        | 346          |
| Hampton .....                                                | N. Y., L. E. & W. R. R. .... | 430          |
| Hancock .....                                                | N. Y., L. E. & W. R. R. .... | 926          |
| Hankin's .....                                               | N. Y., L. E. & W. R. R. .... | 810          |
| Harford .....                                                | S. C. R. R. ....             | 1,186        |
| Harlem River Station .....                                   | N. Y., N. H. & H. R. R. .... | 9            |
| Harpersville .....                                           | W. & S. R. R. ....           | 1,052        |
| Harrington's Pond (Adirondacks) .....                        | Adirondack Survey .....      | 1,743        |
| Havana .....                                                 | N. C. R. R. ....             | 447          |
| Hayden Mountain (Catskills) .....                            | Appal. Club .....            | 2,900        |
| Haystack Mountain .....                                      | Adirondack Survey .....      | 5,007        |
| Do .....                                                     | Adirondack Survey .....      | 4,855        |
| Hayt's Corners .....                                         | G., I. & S. R. R. ....       | 396          |
| Helching's Pond .....                                        | Adirondack Survey .....      | 1,697        |
| Helsinger Notch (Catskills) .....                            | Appalachian Club .....       | 2,677        |
| Henderson Lake .....                                         | Adirondack Survey .....      | 1,838        |
| Do .....                                                     | Toner .....                  | 1,936        |
| Do .....                                                     | Guyot .....                  | 1,829        |
| Henrietta .....                                              | N. Y., L. E. & W. R. R. .... | 564          |
| Heron Gap, summit road (Catskills) .....                     | Appal. Club .....            | 1,969        |
| Hensonville Cross-roads (Catskills) .....                    | Appal. Club .....            | 1,646        |
| Herkimer .....                                               | N. Y. C. & H. R. R. R. ....  | 398          |
| Herkimer, Geodetic Station .....                             | N. Y. State Survey .....     | 507          |
| High Bridge .....                                            | N. Y. C. & N. R. R. ....     | 8            |
| High Knob (Catskills) .....                                  | Appal. Club .....            | 2,654        |
| Highland Mills .....                                         | N. Y., L. E. & W. R. R. .... | 480          |
| High Peak (Catskills) .....                                  | Appal. Club .....            | 3,664        |
| High Point (Catskills) .....                                 | Appal. Club .....            | 3,098        |
| Hilldale .....                                               | N. Y. & H. R. R. ....        | 671          |
| Hill's Branch .....                                          | G., I. & S. R. R. ....       | 396          |

| Station.                                | Authority.                  | Elevation.   |
|-----------------------------------------|-----------------------------|--------------|
|                                         |                             | <i>Feet.</i> |
| Himrod's.....                           | N. C. R. R.....             | 799          |
| Hinsdale.....                           | N. Y., L. E. & W. R. R..... | 1,501        |
| Hoffman Mountain.....                   | Adirondack Survey.....      | 3,728        |
| Hoffman's.....                          | N. Y., C. & H. R. R. R..... | 266          |
| Holland.....                            | B., N. Y. & P. R. R.....    | 1,176        |
| Holland Patent.....                     | U. & B. R. R. R.....        | 630          |
| Holley.....                             | N. Y., C. & H. R. R. R..... | 537          |
| Holmes' Hill (Adirondacks).....         | Adirondack Survey.....      | 2,086        |
| Holmesville.....                        | R. W. & O. R. R.....        | 320          |
| Homer.....                              | S. & B. R. R.....           | 1,131        |
| Honeoye.....                            | N. Y., C. & H. R. R. R..... | 777          |
| Honey Pond (Adirondacks).....           | Adirondack Survey.....      | 1,644        |
| Hooper.....                             | N. Y., L. E. & W. R. R..... | 839          |
| Hopewell.....                           | N. C. R. R.....             | 850          |
| Do.....                                 | N., D. & C. R. R.....       | 252          |
| Hornellsville.....                      | N. Y., L. E. & W. R. R..... | 1,161        |
| Horseheads.....                         | N. C. R. R.....             | 865          |
| Do.....                                 | U., I. & E. R. R.....       | 899          |
| Howell's.....                           | N. Y., L. E. & W. R. R..... | 699          |
| Howe's Cave.....                        | A. & S. R. R.....           | 782          |
| Hewlett Hill, Geodetic Station.....     | Gardiner.....               | 1,136        |
| Hobsie, Geodetic Station.....           | Gardiner.....               | 1,198        |
| Hudson.....                             | U. S. C. & G. S.....        | 8            |
| Do.....                                 | N. Y. C. & H. R. R. R.....  | 4            |
| Hunter Mountain (Catskills).....        | Appal. Club.....            | 4,038        |
| Hunter Village, Ruak's Catskills.....   | Appal. Club.....            | 1,609        |
| Hunt's.....                             | N. Y., L. E. & W. R. R..... | 1,339        |
| Hurricane Mountain.....                 | Adirondack Survey.....      | 3,763        |
| Husteds.....                            | N., D. & C. R. R.....       | 846          |
| Hyndsville.....                         | A. & S. R. R.....           | 1,112        |
| Ilion.....                              | N. Y. C. & H. R. R. R.....  | 400          |
| Ilion, Geodetic Station.....            | N. Y. State Survey.....     | 549          |
| Indian Head, East peak (Catskills)..... | Appal. Club.....            | 3,370        |
| Do..... Middle peak (Catskills).....    | Appal. Club.....            | 3,510        |
| Do..... West peak (Catskills).....      | Appal. Club.....            | 3,581        |
| Indian Lake (Adirondacks).....          | Adirondack Survey.....      | 1,669        |
| Indian Pass (Adirondacks).....          | Adirondack Survey.....      | 2,902        |
| Do..... (Catskills).....                | Appal. Club.....            | 2,694        |
| Iodna, Geodetic Station.....            | U. S. Lake Survey.....      | 598          |
| Iron Works (Adirondacks).....           | Adirondack Survey.....      | 1,769        |
| Irving.....                             | L. S. & M. S. R. R.....     | 586          |
| Ischua.....                             | B., N. Y. & P. R. R.....    | 1,541        |
| Ithaca.....                             | G., I. & S. R. R.....       | 392          |
| Do.....                                 | C. & S. R. R.....           | 377          |
| Do.....                                 | U., I. & E. R. R.....       | 840          |
| Jackson, Geodetic Station.....          | N. Y. State Survey.....     | 1,420        |
| Jamestown.....                          | A. & G. W. R. R.....        | 1,321        |
| Jamieson.....                           | B., N. Y. & P. R. R.....    | 894          |
| Janesville.....                         | S. & B. R. R.....           | 591          |
| Jessup's Landing.....                   | Adirondack R. R.....        | 606          |
| Johnston.....                           | F., J. & G. R. R.....       | 659          |
| Jordan.....                             | N. Y. C. & H. R. R. R.....  | 406          |
| Kasvay Summit.....                      | R. W. & O. R. R.....        | 639          |
| Kelley's Corner.....                    | U. & D. R. R.....           | 1,378        |
| Kennedy.....                            | A. & G. W. R. R.....        | 1,264        |
| Kimball Mountain (Catskills).....       | Appal. Club.....            | 3,960        |
| Kinderhook.....                         | Boston & Albany R. R.....   | 318          |
| King's.....                             | Adirondack R. R.....        | 588          |
| King's Bridge.....                      | N. Y. C. & N. R. R.....     | 8            |
| King's Ferry.....                       | G., I. & S. R. R.....       | 394          |
| Kingale, Geodetic Station.....          | N. Y. State Survey.....     | 537          |
| Kingston.....                           | W. V. R. R.....             | 186          |
| Kingston.....                           | U. & D. R. R.....           | 159          |
| Kirkland.....                           | Rome & C. R. R.....         | 540          |

| Station.                                          | Authority.                   | Elevation.          |
|---------------------------------------------------|------------------------------|---------------------|
| Kirkville .....                                   | N. Y. C. & H. R. R. R. ....  | <i>Fort.</i><br>423 |
| Do.. Geodetic Station .....                       | N. Y. State Survey .....     | 507                 |
| Kirkwood .....                                    | N. Y., L. E. & W. R. R. .... | 876                 |
| Knowersville .....                                | A. & S. R. R. ....           | 459                 |
| La Fargeville .....                               | U. & B. R. R. R. ....        | 385                 |
| La Grange .....                                   | N., D. & C. R. R. ....       | 357                 |
| Lake Ridge .....                                  | G., I. & S. R. R. ....       | 401                 |
| Lake Station .....                                | W. V. R. R. ....             | 543                 |
| Lake View .....                                   | L. S. & M. S. R. R. ....     | 709                 |
| Do .....                                          | R. & L. O. R. R. ....        | 312                 |
| Lancaster .....                                   | N. Y., L. E. & W. R. R. .... | 683                 |
| Lanona .....                                      | N. Y., L. E. & W. R. R. .... | 1,157               |
| Lansingburg .....                                 | U. S. C. & G. S. ....        | 33                  |
| Laona .....                                       | D., A. V. & P. R. R. ....    | 810                 |
| La Salle .....                                    | N. Y., L. E. & W. R. R. .... | 572                 |
| Lawrenceville .....                               | Corning, C. & A. R. R. ....  | 1,006               |
| Lebanon .....                                     | S. & C. V. R. R. ....        | 1,336               |
| Leonard Hill (Catskills) .....                    | Appal. Club .....            | 2,649               |
| Le Roy .....                                      | N. Y., L. E. & W. R. R. .... | 872                 |
| Levant, grade, crossing D., A. V. & P. R. R. .... | A. & G. W. R. R. ....        | 1,267               |
| Lewey Lake .....                                  | Adirondack Survey .....      | 1,702               |
| Do .....                                          | Geol. Survey of N. Y. ....   | 1,738               |
| Do..... Mountain .....                            | Adirondack Survey .....      | 3,904               |
| Lewiston .....                                    | N. Y. C. & H. R. R. R. ....  | 358                 |
| Lexington Mountain, approx. (Catskills) ..        | Appal. Club .....            | 2,930               |
| Leyden .....                                      | U. & B. R. R. R. ....        | 990                 |
| Liberty .....                                     | N. Y., L. E. & W. R. R. .... | 1,293               |
| Lime Rock .....                                   | R. & S. L. R. R. ....        | 777                 |
| Limestone .....                                   | N. Y., L. E. & W. R. R. .... | 1,416               |
| Linden .....                                      | N. Y., L. E. & W. R. R. .... | 1,181               |
| Lindley .....                                     | Corning, C. & A. R. R. ....  | 977                 |
| Lipp's .....                                      | N. Y., L. E. & W. R. R. .... | 390                 |
| Little Falls .....                                | N. Y. C. & H. R. R. R. ....  | 376                 |
| Little Falls, Geodetic Station .....              | Y. Y. State Survey .....     | 797                 |
| Little Tupper's Lake .....                        | Adirondack Survey .....      | 1,504               |
| Little Valley .....                               | N. Y., L. E. & W. R. R. .... | 1,594               |
| Livingstonville (Catskills) .....                 | Appal. Club .....            | 1,100               |
| Livonia .....                                     | N. Y., L. E. & W. R. R. .... | 1,030               |
| Locke .....                                       | S. C. R. R. ....             | 799                 |
| Lockport .....                                    | N. Y. C. & H. R. R. R. ....  | 600                 |
| Lockport Junction .....                           | L. & B. R. R. ....           | 638                 |
| Lockwood Gap (Catskills) .....                    | Appal. Club .....            | 3,446               |
| Lone Mountain (Catskills) .....                   | U. & B. R. R. R. ....        | 3,670               |
| Long Lake .....                                   | Geol. Survey of N. Y. ....   | 1,690               |
| Do .....                                          | Geol. Survey of N. Y. ....   | 1,575               |
| Do .....                                          | Adirondack Survey .....      | 1,584               |
| Long Pond .....                                   | Adirondack Survey .....      | 1,573               |
| Do .....                                          | Adirondack Survey .....      | 1,925               |
| Long Pond Mountain .....                          | Adirondack Survey .....      | 2,269               |
| Do .....                                          | Adirondack Survey .....      | 2,232               |
| Long Tour .....                                   | Adirondack Survey .....      | 2,604               |
| Lordville .....                                   | N. Y., L. E. & W. R. R. .... | 867                 |
| Loring's .....                                    | C., C. & De R. R. R. ....    | 1,115               |
| Lost Lake .....                                   | Geol. Survey of N. Y. ....   | 1,761               |
| Lower Saranac Lake .....                          | Geol. Survey of N. Y. ....   | 1,527               |
| Ludlowville .....                                 | G., I. & S. R. R. ....       | 396                 |
| Lyon Mountain .....                               | Chat. R. R. ....             | 1,918               |
| Lyons .....                                       | N. Y. C. & H. R. R. R. ....  | 407                 |
| Lyons Falls .....                                 | U. & B. R. R. R. ....        | 845                 |
| Macedon .....                                     | N. Y. C. & H. R. R. R. ....  | 471                 |
| Machias .....                                     | B., N. Y. & P. R. R. ....    | 1,656               |
| Do, junction with B. N. Y. & P. R. R. ....        | R. & S. L. R. R. ....        | 1,646               |
| McIntyre .....                                    | P. H. & B. R. R. ....        | 438                 |

| Station.                             | Authority.                  | Elevation.   |
|--------------------------------------|-----------------------------|--------------|
|                                      |                             | <i>Feet.</i> |
| yre, Mount.....                      | Geol. Survey of N. Y.....   | 5,183        |
| n.....                               | U. I. & E. R. R.....        | 1,090        |
| ney's.....                           | G. I. & S. R. R.....        | 396          |
| tin, Mount.....                      | Geol. Survey of N. Y.....   | 5,000        |
| 's.....                              | N. Y., L. E. & W. R. R..... | 576          |
| b's Mountain.....                    | Adirondack Survey.....      | 4,371        |
| ac.....                              | N. Y. C. & N. R. R.....     | 641          |
| .. Lake.....                         | N. Y., B. & M. R. R.....    | 661          |
| s Corners (Catskills).....           | Appal. Club.....            | 1,964        |
| yville.....                          | U., I. & E. R. R.....       | 1,067        |
| s.....                               | N. Y. C. & H. R. R. R.....  | 416          |
| .....                                | S. & C. V. R. R.....        | 742          |
| s Centre.....                        | S. & C. V. R. R.....        | 435          |
| ville, Geodetic Station.....         | U. S. Lake Survey.....      | 725          |
| rill (Catskills).....                | Appal. Club.....            | 1,520        |
| own, Geodetic Station.....           | N. Y. State Survey.....     | 1,214        |
| ion.....                             | S. & B. R. R.....           | 1,026        |
| .....                                | U. & B. R. R. R.....        | 587          |
| .. Mount.....                        | Adirondack Survey.....      | 5,403        |
| ..do.....                            | Guyot.....                  | 5,379        |
| ..do.....                            | Adirondack Survey.....      | 5,334        |
| ..do.. Timber line on.....           |                             | 4,851        |
| sburg.....                           | U. & B. R. R. R.....        | 760          |
| lle.....                             | S. C. R. R.....             | 367          |
| nd.....                              | A. & S. R. R.....           | 1,220        |
| .. Lake.....                         | Geol. Survey of N. Y.....   | 1,960        |
| .....                                | Adirondack Survey.....      | 1,824        |
| van.....                             | U., D. & C. R. R.....       | 119          |
| m, Mount.....                        | Adirondack Survey.....      | 2,511        |
| .....                                | Adirondack Survey.....      | 2,474        |
| ld.....                              | F., J. & G. R. R.....       | 759          |
| le.....                              | B., C. & P. R. R.....       | 1,300        |
| .....                                | N. Y. C. & H. R. R. R.....  | 545          |
| is.....                              | N. Y. C. & H. R. R. R.....  | 410          |
| 's Corners.....                      | N. Y. C. & N. R. R.....     | 346          |
| Geodetic Station.....                | N. Y. State Survey.....     | 1,328        |
| .....                                | R., W. & Og. R. R.....      | 375          |
| burg Railroad depot (Catskills)..... | Appal. Club.....            | 640          |
| town.....                            | N. Y., L. E. & W. R. R..... | 562          |
| ok.....                              | N., D. & C. R. R.....       | 566          |
| s Corners.....                       | N. Y. C. & H. R. R. R.....  | 896          |
| on.....                              | N. Y. & H. R. R. R.....     | 702          |
| .....                                | N. C. R. R.....             | 857          |
| .. Geodetic Station.....             | N. Y. State Survey.....     | 1,343        |
| ell's.....                           | N., D. & C. R. R.....       | 966          |
| Hill (Catskills).....                | Appal. Club.....            | 2,810        |
| o.....                               | O. & S. R. R.....           | 334          |
| ille (Adirondacks).....              | Adirondack Survey.....      | 1,338        |
| Mountain (Catskills).....            | Appal. Club.....            | 3,807        |
| ll, Geodetic Station.....            | N. Y. State Survey.....     | 881          |
| y Hill (Mucky) (Catskills).....      | Appal. Club.....            | 2,489        |
| y.....                               | N. Y., L. E. & W. R. R..... | 523          |
| omery.....                           | N. Y., L. E. & W. R. R..... | 386          |
| Lake.....                            | Toner.....                  | 1,772        |
| .....                                | D., A. V. & P. R. R.....    | 1,303        |
| s.....                               | N., D. & C. R. R.....       | 439          |
| Lake.....                            | Geol. Survey of N. Y.....   | 2,239        |
| .....                                | Adirondack Survey.....      | 2,203        |
| la.....                              | S. C. R. R.....             | 732          |
| nville, Geodetic Station.....        | U. S. Lake Survey.....      | 885          |
| 's.....                              | L. S. & M. S. R. R.....     | 627          |
| Dock.....                            | N. Y. C. & N. R. R.....     | 9            |
| onville.....                         | Chat. R. R.....             | 449          |
| town.....                            | U. & B. R. R. R.....        | 251          |

| Station.                                                | Authority.                   | Elevation.   |
|---------------------------------------------------------|------------------------------|--------------|
|                                                         |                              | <i>Feet.</i> |
| Moss Lake .....                                         | Geol. Survey of N. Y. ....   | 4,312        |
| Moth's Corners .....                                    | U., I. & E. R. R. ....       | 945          |
| Mountainville .....                                     | N. Y., L. E. & W. R. R. .... | 260          |
| Mount Morris .....                                      | N. Y., L. E. & W. R. R. .... | 586          |
| Mud Lake .....                                          | Geol. Survey of N. Y. ....   | 1,747        |
| Do. Lake .....                                          | Adirondack Survey .....      | 1,738        |
| Mumford .....                                           | R. & S. L. R. R. ....        | 618          |
| Munn Davis, Geodetic Station .....                      | N. Y. State Survey .....     | 538          |
| Munroe .....                                            | N. Y., L. E. & W. R. R. .... | 696          |
| Murrey .....                                            | N. Y. C. & H. R. R. R. ....  | 568          |
| Nannet .....                                            | N. Y., L. E. & W. R. R. .... | 284          |
| Narrowsburg .....                                       | N. Y., L. E. & W. R. R. .... | 720          |
| Neely Town .....                                        | N. Y., L. E. & W. R. R. .... | 390          |
| Nellis, Geodetic Station .....                          | N. Y. State Survey .....     | 588          |
| Newark .....                                            | N. Y. C. & H. R. R. R. ....  | 418          |
| Newark Valley .....                                     | S. C. R. R. ....             | 966          |
| Newburgh .....                                          | N. Y., L. E. & W. R. R. .... | 25           |
| Do .....                                                | N. Y., W. S. & B. R. R. .... | 11           |
| Newburgh Junction .....                                 | N. Y., L. E. & W. R. R. .... | 521          |
| Newcombe, Lake .....                                    | Toner .....                  | 1,698        |
| Newfield .....                                          | G., I. & S. R. R. ....       | 527          |
| New Haven .....                                         | R. W. & O. R. H. ....        | 306          |
| New Milford .....                                       | W. V. R. R. ....             | 452          |
| New Platz .....                                         | W. V. R. R. ....             | 266          |
| Newport .....                                           | R. & L. O. R. R. ....        | 396          |
| New Rochelle .....                                      | N. Y. & N. H. R. R. ....     | 70           |
| New Scotland .....                                      | A. & S. R. R. ....           | 327          |
| New Windsor .....                                       | N. Y., L. E. & W. R. R. .... | 192          |
| New York, junction of Chatham street and Broadway ..... | N. Y. & N. H. R. R. ....     | 34           |
| Do. 27th street depot .....                             | N. Y. & N. H. R. R. ....     | 37           |
| Do. 42d street depot (Grand Central) .....              | N. Y. & N. H. R. R. ....     | 52           |
| Do. Harlem Bridge .....                                 | N. Y. & N. H. R. R. ....     | 12           |
| Do. Chambers street .....                               | N. Y. C. & H. R. R. R. ....  | 22           |
| Do. Signal Station .....                                | U. S. Signal Office .....    | 164          |
| Do. Manhattan Gas Works (18th st.) .....                | U. S. C. & G. S. ....        | 15           |
| Niagara Falls .....                                     | N. Y. C. & H. R. R. R. ....  | 574          |
| Niger, Lake .....                                       | Geol. Survey of N. Y. ....   | 1,842        |
| Niles, Geodetic Station .....                           | N. Y. State Survey .....     | 1,623        |
| Nineveh Junction .....                                  | A. & S. R. R. ....           | 1,032        |
| Nipple Top .....                                        | Geol. Survey of N. Y. ....   | 4,900        |
| Do .....                                                | Adirondack Survey .....      | 4,684        |
| Nobody's .....                                          | N. Y., L. E. & W. R. R. .... | 748          |
| North Beacon .....                                      | Guyot .....                  | 1,471        |
| North Collins .....                                     | B. & S. W. R. R. ....        | 846          |
| North Creek .....                                       | Adir. R. R. ....             | 976          |
| North Mountain, East Peak (Catskills) .....             | Appal. Club .....            | 3,286        |
| Do. Outlook (Catskills) .....                           | Appal. Club .....            | 3,100        |
| Do. W. Stopel (Catskills) .....                         | Appal. Club .....            | 3,440        |
| North River Mountain (Adirondacks) .....                | Geol. Survey of N. Y. ....   | 3,600        |
| Do. do .....                                            | Adirondack Survey .....      | 3,759        |
| Do. do .....                                            | Adirondack Survey .....      | 3,722        |
| Northville .....                                        | F., J. & G. R. R. ....       | 770          |
| North Yonkers .....                                     | N. Y. C. & N. R. R. ....     | 164          |
| Norton's .....                                          | D., A. V. & P. R. R. ....    | 991          |
| Do. .....                                               | G., I. & S. R. R. ....       | 404          |
| Norwich .....                                           | U., C. & S. R. R. ....       | 1,001        |
| Nunda .....                                             | N. Y., L. E. & W. R. R. .... | 1,336        |
| Odells .....                                            | N. Y. C. & N. R. R. ....     | 119          |
| Ogdensburg .....                                        | U. & B. R. R. R. ....        | 248          |
| Olean .....                                             | N. Y., L. E. & W. R. R. .... | 1,438        |
| Olive Branch .....                                      | U. & D. R. R. ....           | 504          |
| Olympus, Geodetic Station .....                         | Gardiner .....               | 681          |
| Oncida .....                                            | N. Y. C. & H. R. R. R. ....  | 440          |

| Station.                                | Authority.                   | Elevation.   |
|-----------------------------------------|------------------------------|--------------|
|                                         |                              | <i>Feet.</i> |
| .....                                   | N. Y. & Oswego Mid. R. R...  | 419          |
| , Lake .....                            | Toner .....                  | 360          |
| .....                                   | A. & S. R. R. ....           | 1,087        |
| , Lake .....                            | U. S. Lake Survey .....      | 247          |
| .....                                   | R., W. & O. R. R. ....       | 415          |
| burg .....                              | N. Y., L. E. & W. R. R. .... | 67           |
| Farm .....                              | N. Y., L. E. & W. R. R. .... | 406          |
| ry .....                                | N. Y. C. & H. R. R. R. ....  | 423          |
| e Hollow .....                          | A. & S. R. R. ....           | 1,115        |
| la, Geodetic Station .....              | N. Y. State Survey .....     | 1,274        |
| .....                                   | O. & S. R. R. ....           | 293          |
| .....                                   | R., W. & O. R. R. ....       | 280          |
| .....                                   | N. Y. & O. R. R. ....        | 301          |
| Geodetic Station .....                  | U. S. Lake Survey .....      | 418          |
| Junction .....                          | S. C. R. R. ....             | 316          |
| Signal Station .....                    | U. S. Signal Office .....    | 304          |
| e .....                                 | N. Y., L. E. & W. R. R. .... | 870          |
| Lake .....                              | A. & S. R. R. ....           | 1,054        |
| ake .....                               | Toner .....                  | 2,206        |
| a Pass (Adirondacks) .....              | Adirondack Survey .....      | 3,050        |
| ga .....                                | A. & S. R. R. ....           | 991          |
| ake .....                               | Geol. Survey of N. Y. ....   | 2,025        |
| k Mountain (Catskills) .....            | Appal. Club .....            | 3,150        |
| entre .....                             | G., I. & S. R. R. ....       | 819          |
| , Lake, water-surface .....             | S. C. R. R. ....             | 713          |
| .....                                   | N. Y., L. E. & W. R. R. .... | 822          |
| lead .....                              | Adirondack Survey .....      | 2,825        |
| lead Mountain (Adirondacks) .....       | Adirondack Survey .....      | 2,789        |
| .....                                   | N. Y., L. E. & W. R. R. .... | 540          |
| .....                                   | U., C. & S. R. R. ....       | 980          |
| Post .....                              | N. Y., L. E. & W. R. R. .... | 945          |
| e Bridge .....                          | N. Y. C. & H. R. R. R. ....  | 304          |
| lle Overlook (Catskills) .....          | Appal. Club .....            | 1,660        |
| lle Union Church (Catskills) .....      | Appal. Club .....            | 470          |
| a .....                                 | N. Y. C. & H. R. R. R. ....  | 434          |
| Geodetic Station .....                  | U. S. Lake Survey .....      | 669          |
| .....                                   | B., C. & P. R. R. ....       | 1,545        |
| kill Mountain (Catskills) .....         | Appal. Club .....            | 3,828        |
| .....                                   | U., C. & S. V. R. R. ....    | 1,422        |
| .....                                   | R., W. & O. R. R. ....       | 474          |
| Hill, Star Rock (Catskills) .....       | Appal. Club .....            | 2,545        |
| Notch (Catskills) .....                 | Appal. Club .....            | 2,415        |
| ation .....                             | U., I. & E. R. R. ....       | 1,515        |
| n .....                                 | R. & S. L. R. R. ....        | 940          |
| Moose (Catskills) .....                 | Appal. Club .....            | 3,875        |
| reek .....                              | R. & S. L. R. R. ....        | 988          |
| ill .....                               | U. S. C. & G. S. ....        | 7            |
| Geodetic Station .....                  | U. S. Lake Survey .....      | 661          |
| n .....                                 | N. C. R. R. ....             | 756          |
| urgh .....                              | N. Y., L. E. & W. R. R. .... | 1,260        |
| lle .....                               | C., C. & De R. R. R. ....    | 1,041        |
| .....                                   | N. Y., L. E. & W. R. R. .... | 1,350        |
| urg Mountain .....                      | Appal. Club .....            | 2,534        |
| urg Pass .....                          | Appal. Club .....            | 2,075        |
| phia .....                              | U. & B. R. R. R. ....        | 485          |
| ille .....                              | N. Y., L. E. & W. R. R. .... | 1,390        |
| la .....                                | U. & D. R. R. ....           | 796          |
| it .....                                | N. Y., L. E. & W. R. R. .... | 6            |
| .....                                   | R. & S. L. R. R. ....        | 1,673        |
| il (Catskills) .....                    | Appal. Club .....            | 1,512        |
| l .....                                 | N. Y., K. & S. R. R. ....    | 1,889        |
| .....                                   | N. & D. R. R. ....           | 1,679        |
| and .....                               | N. Y., L. E. & W. R. R. .... | 406          |
| and Mountain, approx. (Catskills) ..... | Appal. Club .....            | 3,086        |

| Station.                                | Authority.                   | Elevation.   |
|-----------------------------------------|------------------------------|--------------|
|                                         |                              | <i>Feet.</i> |
| Pine Plains .....                       | P., H. & B. R. R. ....       | 470          |
| Pine Valley .....                       | N. C. R. R. ....             | 865          |
| Pinnacle Hill, Geodetic Station .....   | U. S. Lake Survey .....      | 752          |
| Pisco, Lake .....                       | Toner .....                  | 1,648        |
| Pisgah (Catskills) .....                | Appal. Club .....            | 2,905        |
| Pittsfield Summit .....                 | N. Y., K. & S. R. R. ....    | 1,568        |
| Plaaterkill Mountain (Catskills) .....  | Appal. Club .....            | 3,280        |
| Placid Lake .....                       | State Survey of N. Y. ....   | 1,991        |
| Do. ....                                | Adirondack Survey .....      | 1,950        |
| Platt Creek Church (Catskills) .....    | Appal. Club .....            | 1,683        |
| Plattsburgh .....                       | Chat. R. R. ....             | 119          |
| Pleasant Lake (Adirondacks) .....       | Toner .....                  | 1,706        |
| Do. .... do .....                       | Adirondack Survey .....      | 1,579        |
| Pleasant Mountain .....                 | U. & D. R. R. ....           | 609          |
| Pleasant Valley .....                   | P., H. & B. R. R. ....       | 199          |
| Point of Rocks (Catskills) .....        | Appal. Club .....            | 2,175        |
| Poland .....                            | A. & G. W. R. R. ....        | 1,269        |
| Poolville .....                         | U., C. & S. B. R. R. ....    | 1,099        |
| Portage .....                           | N. Y., L. E. & W. R. R. .... | 1,314        |
| Port Bryan .....                        | N. Y. C. & H. R. R. R. ....  | 406          |
| Port Crane .....                        | A. & S. R. R. ....           | 1,041        |
| Port Jervis .....                       | N. Y., L. E. & W. R. R. .... | 442          |
| Port Leyden .....                       | U. & B. R. R. ....           | 900          |
| Portville .....                         | B., N. Y. & P. R. R. ....    | 1,442        |
| Post Creek P. O. ....                   | S., G. & C. R. R. ....       | 1,187        |
| Poughkeepsie .....                      | U., S. C. & G. S. ....       | 42           |
| Do. ....                                | P., H. & B. R. R. ....       | 179          |
| Do. ....                                | N. Y. C. & H. R. R. R. ....  | 139          |
| Prattsville Hotel (Catskills) .....     | Appal. Club .....            | 1,164        |
| Preble .....                            | S. & B. R. R. ....           | 1,183        |
| Preston Hollow (Catskills) .....        | Appal. Club .....            | 870          |
| Prospect .....                          | B., C. & P. R. R. ....       | 1,221        |
| Do. (Center Peak) .....                 | Appal. Club .....            | 2,591        |
| Prospect, Geodetic Station .....        | N. Y. State Survey .....     | 1,380        |
| Prospects .....                         | U. & B. R. R. R. ....        | 1,010        |
| Protection .....                        | B., N. Y. & P. R. R. ....    | 1,383        |
| Puffer Pond (Adirondacks) .....         | Adirondack Survey .....      | 2,193        |
| Pulaski .....                           | R., W. & Og. R. R. ....      | 377          |
| Rafinesque Mountain (Adirondacks) ..... | U. S. C. & G. S. ....        | 1,186        |
| Raft Hill .....                         | Adirondack Survey .....      | 2,106        |
| Ragged Mountain .....                   | Adirondack Survey .....      | 4,163        |
| Do. .... by level (Adirondacks) .....   | Adirondack Survey .....      | 4,127        |
| Ramapo .....                            | N. Y., L. E. & W. R. R. .... | 310          |
| Randolph .....                          | A. & G. W. R. R. ....        | 1,318        |
| Rathbonville .....                      | N. Y., L. E. & W. R. R. .... | 1,015        |
| Raven Hill .....                        | Adirondack Survey .....      | 1,982        |
| Reaman, Geodetic Station .....          | N. Y. State Survey .....     | 799          |
| Red Creek .....                         | N. Y., L. E. & W. R. R. .... | 525          |
| Redfalls P. O. (Catskills) .....        | Appal. Club .....            | 1,270        |
| Redfield, Mount .....                   | Adirondack Survey .....      | 4,628        |
| Red House .....                         | A. & G. W. R. R. ....        | 1,353        |
| Remson .....                            | U. & B. R. R. R. ....        | 1,185        |
| Redwood .....                           | U. & B. R. R. R. ....        | 366          |
| Richford .....                          | S. C. R. R. ....             | 1,097        |
| Rich Lake .....                         | Geol. Survey of N. Y. ....   | 1,547        |
| Richland Junction .....                 | R., W. & O. R. R. ....       | 523          |
| Richmond .....                          | R., W. & O. R. R. ....       | 524          |
| Richmond Cone (Catskills) .....         | Appal. Club .....            | 3,202        |
| Richmondville .....                     | A. & S. R. R. ....           | 1,173        |
| Richville .....                         | N. Y. C. & H. R. R. R. ....  | 626          |
| Rift Hill .....                         | Adirondack Survey .....      | 2,141        |
| Riga Mountain .....                     | P., H. & B. R. R. ....       | 779          |
| Ripley .....                            | L. S. & M. S. R. R. ....     | 750          |
| Ripley crossing .....                   | L. S. & M. S. R. R. ....     | 736          |

| Station.                        | Authority.                   | Elevation.   |
|---------------------------------|------------------------------|--------------|
|                                 |                              | <i>Fect.</i> |
| hill, Geodetic Station .....    | N. Y. State Survey .....     | 1,968        |
| .....                           | Adirondack Survey .....      | 815          |
| .....                           | N. Y. C. & H. R. R. R. ....  | 508          |
| at Norton Station .....         | R. & L. O. R. R. ....        | 448          |
| at Ridge Road .....             | R. & L. O. R. R. ....        | 428          |
| Signal Station .....            | U. S. Signal Office .....    | 587          |
| Forest House .....              | R. & L. O. R. R. ....        | 428          |
| .....                           | N. Y., L. E. & W. R. R. .... | 767          |
| .....                           | N. Y. C. & H. R. R. R. ....  | 445          |
| odetic Station .....            | N. Y. State Survey .....     | 506          |
| .....                           | G., I. & S. R. R. ....       | 719          |
| .....                           | U. & D. R. R. ....           | 6            |
| le .....                        | W. V. R. R. ....             | 187          |
| ch .....                        | Appal. Club .....            | 2,743        |
| .....                           | U. & B. R. R. R. ....        | 326          |
| l .....                         | D., A., V. & P. R. R. ....   | 1,262        |
| ake (Adirondacks) .....         | Adirondack Survey .....      | 1,886        |
| op (Catskills) .....            | Appal. Club .....            | 3,500        |
| .....                           | U. & D. R. R. ....           | 1,501        |
| .....                           | N. Y., L. E. & W. R. R. .... | 541          |
| untain (Catskills) .....        | Appal. Club .....            | 3,626        |
| .....                           | P. H. & B. R. R. ....        | 227          |
| h, Geodetic Station .....       | N. Y. State Survey .....     | 411          |
| ountain .....                   | Adirondack Survey .....      | 4,536        |
| nsville .....                   | N. Y. C. & H. R. R. R. ....  | 319          |
| ca .....                        | N. Y., L. E. & W. R. R. .... | 1,384        |
| Erie R. R. Junction .....       | R. & S. L. R. R. ....        | 1,397        |
| .....                           | N. Y., L. E. & W. R. R. .... | 312          |
| ake .....                       | Geol. Survey of N. Y. ....   | 1,756        |
| it .....                        | P. H. & B. R. R. ....        | 249          |
| 's .....                        | O. & S. R. R. ....           | 400          |
| Lake (Adirondacks) .....        | Adirondack Survey .....      | 1,685        |
| .....                           | Guyot .....                  | 1,731        |
| .....                           | Geol. Survey of N. Y. ....   | 1,722        |
| l .....                         | R., W. & O. R. R. ....       | 313          |
| re .....                        | Toner .....                  | 1,793        |
| reek, Geodetic Station .....    | U. S. Lake Survey .....      | 486          |
| .....                           | R., W. & O. R. R. ....       | 559          |
| ni Mountain .....               | Adirondack Survey .....      | 4,644        |
| .....                           | N. Y., L. E. & W. R. R. .... | 1,065        |
| .....                           | Chat. R. R. ....             | 1,488        |
| Lake (lower) .....              | Geol. Survey of N. Y. ....   | 1,557        |
| Lake (upper) .....              | Geol. Survey of N. Y. ....   | 1,606        |
| , station D. & H. C. R. R. .... | City Engineer .....          | 265          |
| ..... B., H. S. & W. R. R. .... | City Engineer .....          | 265          |
| .....                           | R. & S. R. R. ....           | 304          |
| h .....                         | G., I. & S. R. R. ....       | 407          |
| .....                           | N. Y., L. E. & W. R. R. .... | 1,053        |
| dy .....                        | N. Y. C. & H. R. R. R. ....  | 246          |
| as .....                        | A. & S. R. R. ....           | 1,272        |
| k .....                         | Bost. & Albany R. R. ....    | 208          |
| e .....                         | A. & S. R. R. ....           | 610          |
| e (east peak, Catskills) .....  | Appal. Club .....            | 3,583        |
| .. (west peak, Catskills) ..... | Appal. Club .....            | 3,650        |
| Lake .....                      | Toner .....                  | 1,200        |
| , Geodetic Station .....        | N. Y. State Survey .....     | 1,582        |
| .....                           | N. Y., L. E. & W. R. R. .... | 1,460        |
| .....                           | S. C. R. R. ....             | 730          |
| onds, No. 1 (Adirondacks) ..... | Adirondack Survey .....      | 3,055        |
| ..... No. 2 (Adirondacks) ..... | Adirondack Survey .....      | 3,132        |
| le .....                        | N. Y., L. E. & W. R. R. .... | 558          |
| .. Geodetic Station .....       | U. S. Lake Survey .....      | 796          |
| .....                           | R., W. & O. R. R. ....       | 329          |
| ountain .....                   | Geol. Survey of N. Y. ....   | 3,200        |



| Station.                             | Authority.                               | Elevation.   |
|--------------------------------------|------------------------------------------|--------------|
|                                      |                                          | <i>Feet.</i> |
| Seeley, Geodetic Station .....       | N. Y. State Survey .....                 | 1,109        |
| Seneca Lake .....                    | Geol. Survey of N. Y. ....               | 370          |
| Do .....                             | G., I. & S. R. R. ....                   | 445          |
| Do .....                             | S., G. & C. R. R. ....                   | 447          |
| Seward .....                         | A. & S. R. R. ....                       | 1,177        |
| Seward Mountain (Adirondacks) .....  | Adirondack Survey .....                  | 4,319        |
| Do .....                             | Adirondack Survey .....                  | 4,385        |
| Seymore, Mount. ....                 | Adirondack Survey .....                  | 3,929        |
| Shakers .....                        | N. Y., L. E. & W. R. R. ....             | 574          |
| Shandaken .....                      | U. & D. R. R. ....                       | 1,072        |
| Sharon .....                         | A. & S. R. R. ....                       | 1,353        |
| Shawangunk .....                     | W. V. R. R. ....                         | 277          |
| Shed's Corners .....                 | C., C. & De R. R. R. ....                | 1,383        |
| Shekomeko .....                      | U., D. & C. R. R. ....                   | 667          |
| Sheridan .....                       | L. S. & M. S. R. R. ....                 | 664          |
| Do .....                             | N. Y., L. E. & W. R. R. ....             | 760          |
| Sherman .....                        | B. C. & P. R. R. ....                    | 1,568        |
| Sherwood, Geodetic Station .....     | N. Y. State Survey .....                 | 799          |
| Shoemaker, Geodetic Station .....    | N. Y. State Survey .....                 | 1,372        |
| Shokan .....                         | U. & D. R. R. ....                       | 537          |
| Shurtleff's .....                    | U. & B. R. R. R. ....                    | 416          |
| Sidney .....                         | A. & S. R. R. ....                       | 990          |
| Sidney Centre .....                  | N. Y. & O. R. R. ....                    | 997          |
| Do Plains .....                      | N. Y. & O. R. R. ....                    | 1,393        |
| Silver Creek .....                   | L. S. & M. S. R. R. ....                 | 623          |
| Do .....                             | Geodetic Station .....                   | 726          |
| Silver Lake .....                    | Geol. Survey of N. Y. ....               | 1,983        |
| Do .....                             | Mountain .....                           | 2,604        |
| Sinclairville .....                  | D., A. V. & P. R. R. ....                | 1,330        |
| Sing Sing .....                      | N. Y. C. & H. R. R. R. ....              | 9            |
| Sister Knob (Catskills) .....        | Appal. Club .....                        | 3,002        |
| Skaneateles, Lake .....              | Toner .....                              | 932          |
| Skidmore .....                       | D., A. V. & P. R. R. ....                | 1,317        |
| Skylight Mountain .....              | Adirondack Survey .....                  | 4,978        |
| Slide Mountain (Catskills) .....     | Appal. Club .....                        | 4,205        |
| Slingerlands .....                   | A. & S. R. R. ....                       | 214          |
| Sloatsburg .....                     | N. Y., L. E. & W. R. R. ....             | 350          |
| Smithsborough .....                  | N. Y., L. E. & W. R. R. ....             | 799          |
| Smith's Lake .....                   | Geol. Survey of N. Y. ....               | 1,775        |
| Do .....                             | (Adirondacks) .....                      | 1,738        |
| Smith's Mills .....                  | N. Y., L. E. & W. R. R. ....             | 1,010        |
| Smith's Valley .....                 | U., C. & B. R. R. ....                   | 1,140        |
| Smithton (Catskills) .....           | Appal. Club .....                        | 1,268        |
| Snowy Mountain .....                 | Adirondack Survey .....                  | 3,804        |
| Do .....                             | (Adirondacks) .....                      | 3,860        |
| Snyder's .....                       | U. I. & E. R. R. ....                    | 995          |
| Sodus .....                          | R., W. & O. R. R. ....                   | 430          |
| Somerset .....                       | R., W. & O. R. R. ....                   | 332          |
| Sonyea .....                         | N. Y., L. E. & W. R. R. ....             | 592          |
| Sorrell Hill, Geodetic Station ..... | N. Y. State Survey .....                 | 641          |
| South Avon .....                     | N. Y., L. E. & W. R. R. ....             | 620          |
| Do .....                             | N. Y., L. E. & W. R. R. ....             | 725          |
| South Corinth .....                  | Adirondack Survey .....                  | 606          |
| South Cortland .....                 | U., I. & E. R. R. ....                   | 1,151        |
| South Dover .....                    | N. Y. & H. R. R. ....                    | 415          |
| South Durham .....                   | Appal. Club .....                        | 969          |
| Southfield .....                     | N. Y., L. E. & W. R. R. ....             | 491          |
| South Livonia .....                  | N. Y., L. E. & W. R. R. ....             | 1,167        |
| South McIntyre Mountain .....        | Adirondack Survey .....                  | 4,938        |
| South Mountain (Adirondacks) .....   | Adirondack Survey .....                  | 1,917        |
| Do .....                             | near Mountain House<br>(Catskills) ..... | 2,497        |
| South Wales .....                    | B., N. Y. & P. R. R. ....                | 991          |
| South Yonkers .....                  | N. Y. C. & N. R. R. ....                 | 145          |

| Station.                                                  | Authority.                  | Elevation.   |
|-----------------------------------------------------------|-----------------------------|--------------|
|                                                           |                             | <i>Feet.</i> |
| Speculator Mountain.....                                  | Adirondack Survey.....      | 3,041        |
| Do.....                                                   | Adirondack Survey.....      | 3,005        |
| Spencer.....                                              | U., I. & E. R. R.....       | 996          |
| Do.....                                                   | G., I. & S. R. R.....       | 1,006        |
| Spencerport.....                                          | N. Y. C. & H. R. R. R.....  | 530          |
| Sprakers.....                                             | N. Y. C. & H. R. R. R.....  | 301          |
| Spring Brook.....                                         | B., N. Y. & P. R. R.....    | 757          |
| Spring Valley.....                                        | N. Y., L. E. & W. R. R..... | 450          |
| Spring Water.....                                         | N. Y., L. E. W. R. R.....   | 1,370        |
| Sprucetop (Catskill).....                                 | Appal. Club.....            | 3,567        |
| Stafford.....                                             | N. Y. C. & H. R. R. R.....  | 894          |
| Do.....                                                   | N. Y., L. E. & W. R. R..... | 910          |
| Stamford.....                                             | U. & D. R. R.....           | 1,771        |
| Stanfordville.....                                        | P., H. & B. R. R.....       | 323          |
| Stanley, junction with O. & S. R. R.....                  | N. C. R. R.....             | 904          |
| Starkey.....                                              | N. C. R. R.....             | 810          |
| Starr Hill, Geodetic Station.....                         | N. Y. State Survey.....     | 1,793        |
| State Line, N. Y. & Mass.....                             | P., H. & B. R. R.....       | 784          |
| State Line Junction, with extension of<br>Tioga R. R..... | N. C. R. R.....             | 909          |
| State Line, Mass. and N. Y.....                           | Bost. & Albany R. R.....    | 914          |
| Steamburg.....                                            | A. & G. W. R. R.....        | 1,404        |
| Sterlingville.....                                        | U. & B. R. R. R.....        | 580          |
| Stiles.....                                               | O. & S. R. R.....           | 373          |
| Stissing.....                                             | P., H. & B. R. R.....       | 388          |
| Do. Junction.....                                         | U., D. & C. R. R.....       | 437          |
| Stittville.....                                           | U. & B. R. R.....           | 560          |
| Stockport.....                                            | N. Y., L. E. & W. R. R..... | 896          |
| Stony Creek.....                                          | Adir. R. R.....             | 569          |
| Stony Hollow.....                                         | U. & D. R. R.....           | 419          |
| Stony Mountain, east end (Catskills).....                 | Appal. Club.....            | 3,844        |
| Stony Point, Geodetic Station.....                        | U. S. Lake Survey.....      | 276          |
| Stony Ponds.....                                          | Geol. Survey of N. Y.....   | 1,536        |
| Strattons.....                                            | G. I. & S. R. R.....        | 654          |
| Strykersville (Catskills).....                            | Appal. Club.....            | 1,215        |
| Sturgeon Point, Geodetic Station.....                     | U. S. Lake Survey.....      | 611          |
| Stuyvesant.....                                           | U. S. C. & G. S.....        | 20           |
| Sufferns.....                                             | N. Y., L. E. & W. R. R..... | 298          |
| Summerdale.....                                           | B., C. & P. R. R.....       | 1,629        |
| Summit.....                                               | N. Y., L. E. & W. R. R..... | 1,373        |
| Summit Hill.....                                          | N. Y., K. & S. R. R.....    | 1,613        |
| Sunset Rock (Catskills).....                              | Appal. Club.....            | 2,115        |
| Suspension Bridge.....                                    | N. Y. C. & H. R. R. R.....  | 580          |
| Sutton Gap, road (Catskills).....                         | Appal. Club.....            | 2,235        |
| Sutton Hill (Catskills).....                              | Appal. Club.....            | 2,573        |
| Swains.....                                               | N. Y., L. E. & W. R. R..... | 1,313        |
| Swartwood.....                                            | U., I. & E. R. R.....       | 1,059        |
| Syracuse.....                                             | N. Y. C. & H. R. R. R.....  | 403          |
| Table Mountain (Catskills).....                           | Appal. Club.....            | 3,865        |
| Tahawas (Marcy).....                                      | Adirondack Survey.....      | 5,403        |
| Tallman.....                                              | N. Y., L. E. & W. R. R..... | 480          |
| Tanners.....                                              | P., H. & B. R. R.....       | 694          |
| Tanner Geodetic Station.....                              | N. Y. State Survey.....     | 755          |
| Tannersville Hotel (Catskills).....                       | Appal. Club.....            | 1,926        |
| Tarrytown Heights.....                                    | N. Y. C. & N. R. R.....     | 387          |
| Tassel, Geodetic Station.....                             | N. Y. State Survey.....     | 1,948        |
| Toughannock.....                                          | G., I. & S. R. R.....       | 411          |
| Taylor's Mountain.....                                    | Geol. Survey of N. Y.....   | 4,500        |
| Tear of the Clouds, Lake.....                             | Geol. Survey of N. Y.....   | 4,327        |
| Teller, Geodetic Station.....                             | N. Y. State Survey.....     | 407          |
| Thress.....                                               | U. & B. R. R. R.....        | 341          |
| Thress Junction.....                                      | U. & B. R. R. R.....        | 405          |
| Thirteenth Pond (Adirondacks).....                        | Adirondack Survey.....      | 1,652        |
| Thurman.....                                              | Adir. R. R.....             | 545          |

| Station.                                 | Authority.                   | Elevation.   |
|------------------------------------------|------------------------------|--------------|
|                                          |                              | <i>Feet.</i> |
| Tilly Foster .....                       | N. Y. C. & N. R. R. ....     | 401          |
| Tioga .....                              | N. Y., L. E. & W. R. R. .... | 905          |
| Tip Top Summit .....                     | N. Y., L. E. & W. R. R. .... | 1,783        |
| Tivoli .....                             | U. S. C. & G. S. ....        | 9            |
| Tonawanda .....                          | N. Y. C. & H. R. R. R. ....  | 580          |
| Do..... Geodetic Station .....           | U. S. Lake Survey .....      | 628          |
| Tower Mountain (Catskills) .....         | Appal. Club .....            | 2,931        |
| Towners .....                            | N. Y. & H. R. R. ....        | 432          |
| Town Line .....                          | N. Y., L. E. & W. R. R. .... | 742          |
| Traver Geodetic Station .....            | N. Y. State Survey .....     | 236          |
| Treeville .....                          | U., I. & E. R. R. ....       | 1,030        |
| Trenton Falls .....                      | U. & B. R. R. R. ....        | 840          |
| Trewa .....                              | N. Y., L. E. & W. R. R. .... | 872          |
| Tribes Hill .....                        | N. Y. C. & H. R. R. R. ....  | 305          |
| Troy .....                               | N. Y. C. & H. R. R. R. ....  | 16           |
| Do.....                                  | R. & S. R. R. ....           | 30           |
| Trumansburg .....                        | G., I. & S. R. R. ....       | 878          |
| Truxton .....                            | C., C. & De R. R. R. ....    | 1,135        |
| Tully, Lake .....                        | Toner .....                  | 1,200        |
| Tupper's Lake .....                      | Geol. Survey of N. Y. ....   | 1,554        |
| Do.....                                  | Adirondack Survey .....      | 1,504        |
| Turk's Hill, Geodetic Station .....      | U. S. Lake Survey .....      | 931          |
| Turners .....                            | N. Y., L. E. & W. R. R. .... | 556          |
| Unadilla .....                           | A. & S. R. R. ....           | 1,022        |
| Undercliff (Catskills) .....             | Appal. Club .....            | 2,200        |
| Union .....                              | N. Y., L. E. & W. R. R. .... | 840          |
| Union Springs .....                      | G., I. & S. R. R. ....       | 394          |
| Upper Preston Pond (Adirondacks) .....   | Adirondack Survey .....      | 2,170        |
| Upper Saranac Lake .....                 | .....                        | 1,567        |
| Utica .....                              | N. Y. C. & H. R. R. R. ....  | 410          |
| Do.....                                  | U., C. & B. R. R. ....       | 446          |
| Do.....                                  | Erie Canal .....             | 428          |
| Utsyantha Mt. (Catskills) .....          | Appal. Club .....            | 3,203        |
| Vails Gate .....                         | N. Y., L. E. & W. R. R. .... | 283          |
| Do..... Junction .....                   | N. Y., L. E. & W. R. R. .... | 280          |
| Valley .....                             | N. Y., L. E. & W. R. R. .... | 300          |
| Van Courtland .....                      | N. Y. C. & N. R. R. ....     | 20           |
| Vandalia .....                           | N. Y., L. E. & W. R. R. .... | 1,415        |
| Van Denburgh, Geodetic Station .....     | N. Y. State Survey .....     | 264          |
| Vanettersville .....                     | G., I. & S. R. R. ....       | 1,010        |
| Vanderzee, Geodetic Station .....        | G., I. & S. R. R. ....       | 158          |
| Van Etten .....                          | U., I. & E. R. R. ....       | 1,012        |
| Van Hoesen .....                         | Boston & Albany R. R. ....   | 243          |
| Van Wagner's .....                       | P., H. & B. R. R. ....       | 242          |
| Van Wie, Geodetic Station .....          | N. Y. State Survey .....     | 28           |
| Vedder, Geodetic Station .....           | N. Y. State Survey .....     | 1,051        |
| Verbank .....                            | U., D. & C. R. R. ....       | 553          |
| Do..... Village .....                    | U., D. & C. R. R. ....       | 522          |
| Vermont .....                            | D., A. V. & P. R. R. ....    | 1,295        |
| Verona .....                             | N. Y. C. & H. R. R. R. ....  | 467          |
| Verplanck .....                          | U. S. C. & G. S. ....        | 34           |
| Victory, Geodetic Station .....          | U. S. Lake Survey .....      | 576          |
| Do.....                                  | N. Y. State Survey .....     | 568          |
| Vienna, Geodetic Station .....           | N. Y. State Survey .....     | 568          |
| Vlaie, or Fly Mountain (Catskills) ..... | Appal. Club .....            | 3,531        |
| Walden .....                             | W. V. R. R. ....             | 351          |
| Wallace .....                            | N. Y., L. E. & W. R. R. .... | 1,235        |
| Wallface Mountain .....                  | Adirondack Survey .....      | 3,891        |
| Do..... top (Adirondacks) .....          | Adirondack Survey .....      | 3,857        |
| Wallkill Valley Junction .....           | U. & D. R. R. ....           | 188          |
| Walton .....                             | N. Y. & O. R. R. ....        | 1,239        |
| Walworth, Geodetic Station .....         | U. S. Lake Survey .....      | 656          |
| Warner Pass .....                        | N. Y., K. & S. R. R. ....    | 1,963        |
| Warner's .....                           | N. Y., C. & H. R. R. R. .... | 427          |

| Station.                                                 | Authority.                   | Elevation.   |
|----------------------------------------------------------|------------------------------|--------------|
|                                                          |                              | <i>Feet.</i> |
| Warsaw .....                                             | R. & S. L. R. R. ....        | 1,130        |
| Do .....                                                 | N. Y., L. E. & W. R. R. .... | 1,326        |
| Warwick .....                                            | W. V. R. R. ....             | 502          |
| Washingtonville .....                                    | N. Y., L. E. & W. R. R. .... | 310          |
| Waterboro .....                                          | A. & G. W. R. R. ....        | 1,276        |
| Waterport .....                                          | R. W. & O. R. R. ....        | 349          |
| Watertown .....                                          | U. & B. R. R. R. ....        | 455          |
| Do .... Junction .....                                   | R. W. & O. R. R. ....        | 403          |
| Waterville .....                                         | U. C. & S. R. R. ....        | 1,238        |
| Watkins .....                                            | N. C. R. R. ....             | 453          |
| Do .....                                                 | S. G. & C. R. R. ....        | 1,020        |
| Watts' Flats .....                                       | A. & G. W. R. R. ....        | 1,456        |
| Waverly .....                                            | N. Y., L. E. & W. R. R. .... | 836          |
| Wayland .....                                            | N. Y., L. E. & W. R. R. .... | 1,387        |
| Wayland Summit .....                                     | N. Y., L. E. & W. R. R. .... | 1,415        |
| Webster's .....                                          | N. Y., L. E. & W. R. R. .... | 1,348        |
| Weedsport .....                                          | N. Y. C. & H. R. R. R. ....  | 404          |
| Weedsport Depot .....                                    | S. C. R. R. ....             | 429          |
| Do .... crossing N. Y. C. & H. R. R. R.<br>(grade) ..... | S. C. R. R. ....             | 404          |
| Do .... crossing S. C. R. R. (grade) .....               | S. C. R. R. ....             | 425          |
| Do .... crossing Erie Canal (grade) .....                | S. C. R. R. ....             | 406          |
| Wellsbridge .....                                        | A. & S. R. R. ....           | 1,049        |
| Wellsburgh .....                                         | N. Y., L. E. & W. R. R. .... | 831          |
| West Albany .....                                        | N. Y. C. & H. R. R. R. ....  | 196          |
| West Danby .....                                         | G. I. & S. R. R. ....        | 872          |
| West Durham (Catskills) .....                            | Appal. Club .....            | 1,884        |
| West Fayette .....                                       | G. I. & S. R. R. ....        | 609          |
| Westfield .....                                          | L. S. & M. S. R. R. ....     | 697          |
| Do .. Geodetic Station .....                             | U. S. Lake Survey .....      | 1,479        |
| West Hurley .....                                        | U. & D. R. R. ....           | 534          |
| West Jewett Mountain (Catskills) .....                   | Appal. Club .....            | 3,025        |
| West Junction .....                                      | N. Y., L. E. & W. R. R. .... | 920          |
| Westkill Village (Catskills) .....                       | Appal. Club .....            | 1,538        |
| Westmoreland .....                                       | R. & C. R. R. ....           | 528          |
| West Rush .....                                          | N. Y. C. & H. R. R. R. ....  | 562          |
| West Saugerties (quarry bank) .....                      | Appal. Club .....            | 660          |
| West Somers .....                                        | N. Y. C. & N. R. R. ....     | 517          |
| Wheatland .....                                          | R. N. & P. R. R. ....        | 590          |
| Whiteface Mountain .....                                 | Geol. Survey of N. Y. ....   | 4,900        |
| Do .....                                                 | Adirondack Survey .....      | 4,955        |
| White Church .....                                       | U., I. & E. R. R. ....       | 958          |
| Whitehall .....                                          | R. & S. R. R. ....           | 115          |
| White House .....                                        | N. Y., L. E. & W. R. R. .... | 1,530        |
| White Plains .....                                       | N. Y. & H. R. R. ....        | 202          |
| Whiteport .....                                          | W. V. R. R. ....             | 189          |
| Whitesboro .....                                         | N. Y. C. & H. R. R. R. ....  | 415          |
| Windsor .....                                            | A. & S. R. R. ....           | 942          |
| Willetts Point .....                                     | G. I. & S. R. R. ....        | 405          |
| Willetts, Geodetic Station .....                         | N. Y. State Survey .....     | 894          |
| Williams, Geodetic Station .....                         | N. Y. State Survey .....     | 1,163        |
| Williamston .....                                        | R. W. & O. R. R. ....        | 604          |
| Willow Brook .....                                       | P., H. & B. R. R. ....       | 351          |
| Wileysville .....                                        | U., I. & E. R. R. ....       | 940          |
| Wilmington Village (Adirondacks) .....                   | Adirondack Survey .....      | 1,022        |
| Wilson .....                                             | R., W. & O. R. R. ....       | 300          |
| Windham Centre Hotel (Catskills) .....                   | Appal. Club .....            | 1,510        |
| Windham High Peak (Catskills) .....                      | Appal. Club .....            | 3,534        |
| Wolcott .....                                            | R., W. & O. R. R. ....       | 360          |
| Wolfe, Geodetic Station .....                            | U. S. Lake Survey .....      | 308          |
| Woodbury .....                                           | N. Y., L. E. & W. R. R. .... | 442          |
| Woodhull Lake .....                                      | Toner .....                  | 2,019        |
| Woodstock .....                                          | C., C. & De R. R. R. ....    | 1,295        |
| Woodstock Hotel (Catskills) .....                        | Appal. Club .....            | 594          |

| Station.                            | Authority.                  | Elevation.   |
|-------------------------------------|-----------------------------|--------------|
|                                     |                             | <i>Feet.</i> |
| Worcester .....                     | A. & B. R. R. ....          | 1,310        |
| Wyckoff's .....                     | S. C. R. R. ....            | 726          |
| Wyoming .....                       | R. & S. L. R. R. ....       | 965          |
| Yellow Pine, Geodetic Station ..... | N. Y. State Survey .....    | 460          |
| York Centre .....                   | R. M. & P. R. R. ....       | 780          |
| Yorkshire .....                     | B., N. Y. & P. R. R. ....   | 1,458        |
| Yorktown .....                      | N. Y. C. & N. R. R. ....    | 439          |
| Yost's .....                        | N. Y. C. & H. R. R. R. .... | 300          |
| Yule, Geodetic Station .....        | N. Y. State Survey .....    | 1,663        |

# NORTH CAROLINA.

| Station.                              | Authority.                   | Elevation.   |
|---------------------------------------|------------------------------|--------------|
|                                       |                              | <i>Feet.</i> |
| Alexander, Mount.....                 | Guyot.....                   | 6,447        |
| Amos Plott's Balsam.....              | Guyot.....                   | 6,278        |
| Anderson.....                         | U. S. C. & G. S.....         | 1,547        |
| Apex.....                             | R. & A. A. L. R. R.....      | 508          |
| Argyle.....                           | Car. C. R. R.....            | 175          |
| Back Creek.....                       | N. Carolina R. R.....        | 504          |
| Baker's Knob.....                     | U. S. C. & G. S.....         | 1,812        |
| Bald Mountain.....                    | Guyot.....                   | 5,550        |
| Baldwin Depot.....                    | Car. C. R. R.....            | 105          |
| Balsam Cone.....                      | Guyot.....                   | 6,671        |
| Bear Wallow Mountain.....             | U. S. C. & G. S.....         | 4,245        |
| Belton.....                           | A. & F. B. V. R. R.....      | 576          |
| Benn.....                             | U. S. C. & G. S.....         | 2,908        |
| Big Craggy Mountain.....              | Guyot.....                   | 6,090        |
| Do.....do.....                        | U. S. C. & G. S.....         | 6,068        |
| Black Brother.....                    | Guyot.....                   | 6,619        |
| Black Rock.....                       | Guyot.....                   | 5,815        |
| Blackstock Knob.....                  | U. S. C. & G. S.....         | 6,378        |
| Do.....                               | Guyot.....                   | 6,380        |
| Bladenborough.....                    | Car. C. R. R.....            | 110          |
| Bowlen's Pyramid.....                 | Guyot.....                   | 6,348        |
| Bristol.....                          | A. M. & O. R. R.....         | 1,689        |
| Browns.....                           | R. & G. R. R.....            | 355          |
| Brown's Summit.....                   | P. A. L. R. R.....           | 803          |
| Brother Plott.....                    | Guyot.....                   | 6,246        |
| Brown Marsh Depot.....                | Car. C. R. R.....            | 100          |
| Buckley, Mount.....                   | Guyot.....                   | 6,599        |
| Bull's Head.....                      | Guyot.....                   | 5,935        |
| Cameron.....                          | R. & A. A. L. R. R.....      | 309          |
| Cape Hatteras, Signal Station.....    | U. S. Signal Office.....     | 8            |
| Cape Lookout, Signal Station.....     | U. S. Signal Office.....     | 15           |
| Carleton Knob.....                    | U. S. C. & G. S.....         | 2,284        |
| Caroline City.....                    | A. & N. C. R. R.....         | 10           |
| Cary.....                             | R. & A. A. L. R. R.....      | 501          |
| Catawba.....                          | W. N. C. R. R.....           | 1,294        |
| Cat-tail Peak.....                    | Guyot.....                   | 6,611        |
| Cedar Fork.....                       | N. Carolina R. R.....        | 418          |
| Charlotte.....                        | Charlotte, C. & A. R. R..... | 747          |
| Do.....                               | Car. C. R. R.....            | 725          |
| Do.....Signal Station.....            | U. S. Signal Office.....     | 838          |
| Chimney Peak.....                     | Guyot.....                   | 6,234        |
| Chimney Top Mountain.....             | U. S. C. & G. S.....         | 4,573        |
| Chowder.....                          | U. S. C. & G. S.....         | 1,606        |
| Clayton.....                          | N. Carolina R. R.....        | 347          |
| Clingman's Mountain.....              | Guyot.....                   | 6,707        |
| Cold Mountain.....                    | U. S. C. & G. S.....         | 4,627        |
| Do.....                               | Guyot.....                   | 6,063        |
| Cold Spring Mountain.....             | Guyot.....                   | 5,915        |
| Conelly's Gap.....                    | W. N. C. R. R.....           | 1,269        |
| Coxcomb.....                          | Guyot.....                   | 5,426        |
| Craggy Pinnacle.....                  | Guyot.....                   | 5,945        |
| Dallas.....                           | C. & L. N. G. R. R.....      | 944          |
| Deer Mountain.....                    | Guyot.....                   | 6,233        |
| Dover Swamp.....                      | A. & N. C. R. R.....         | 66           |
| Durham.....                           | N. Carolina R. R.....        | 400          |
| Easley.....                           | A. & F. B. V. R. R.....      | 1,043        |
| East Drowning Creek Mountain.....     | U. S. C. & G. S.....         | 2,126        |
| Fodderstack or Terrapin Mountain..... | U. S. C. & G. S.....         | 4,510        |

| Station.                        | Authority.               | Elevation.   |
|---------------------------------|--------------------------|--------------|
|                                 |                          | <i>Feet.</i> |
| Fort Macon, Signal Station..... | U. S. Signal Office..... | 11           |
| Franklinton.....                | R. & G. R. R.....        | 417          |
| Friendship.....                 | N. W. N. C. R. R.....    | 892          |
| Garibaldi.....                  | A. & R. A. L. R. R.....  | 712          |
| Gaston.....                     | R. & G. R. R.....        | 152          |
| Gastonia.....                   | A. & R. A. L. R. R.....  | 832          |
| Gibbs, Mount.....               | Guyot.....               | 6,591        |
| Goldsboro.....                  | N. Carolina R. R.....    | 102          |
| Graham.....                     | N. Carolina R. R.....    | 677          |
| Grandfather.....                | Guyot.....               | 5,897        |
| Graybeard.....                  | Guyot.....               | 5,448        |
| Great Hogback.....              | U. S. C. & G. S.....     | 4,780        |
| Do.....                         | Guyot.....               | 4,792        |
| Greensboro.....                 | R. & D. R. R.....        | 831          |
| Do.....                         | N. Carolina R. R.....    | 430          |
| Hairy Bear.....                 | Guyot.....               | 6,681        |
| Hallback.....                   | Guyot.....               | 6,403        |
| Hall's Store.....               | W. N. C. R. R.....       | 1,154        |
| Hamlet.....                     | R. & A. R. R.....        | 331          |
| Hardy, Mount.....               | U. S. C. & G. S.....     | 6,102        |
| Hatteras, Signal Station.....   | U. S. Signal Office..... | 20           |
| Haw River.....                  | N. Carolina R. R.....    | 523          |
| Henderson.....                  | R. & G. R. R.....        | 506          |
| Hibriten, Mount.....            | U. S. C. & G. S.....     | 2,265        |
| Hickory.....                    | C. & L. N. G. R. R.....  | 1,222        |
| High Pinnacle.....              | Guyot.....               | 5,690        |
| High Point.....                 | N. Carolina R. R.....    | 943          |
| High Shoals Station.....        | Car. C. R. R.....        | 1,001        |
| Hillsborough.....               | N. Carolina R. R.....    | 539          |
| Hoffman.....                    | R. & A. R. R.....        | 335          |
| Huckleberry Knob.....           | Guyot.....               | 5,482        |
| Hudsonville.....                | C. & L. N. G. R. R.....  | 1,321        |
| Jamestown.....                  | N. Carolina R. R.....    | 821          |
| Junaleska, Mount.....           | Guyot.....               | 6,223        |
| Kermisville.....                | N. W. N. C. R. R.....    | 1,016        |
| Keyser.....                     | R. & A. R. R.....        | 286          |
| King.....                       | U. S. C. & G. S.....     | 1,692        |
| King's Mountain.....            | A. & R. A. L. R. R.....  | 952          |
| Kinston.....                    | A. & N. C. R. R.....     | 45           |
| Kittrell.....                   | R. & G. R. R.....        | 417          |
| Kittyhawk, Signal Station.....  | U. S. Signal Office..... | 22           |
| Knights.....                    | N. W. N. C. R. R.....    | 942          |
| Laurel Ridge.....               | Car. C. R. R.....        | 245          |
| Laurinburg.....                 | Car. C. R. R.....        | 230          |
| Lenoir.....                     | C. & L. N. G. R. R.....  | 1,186        |
| Lexington.....                  | N. Carolina R. R.....    | 776          |
| Lickstone Mountain.....         | Guyot.....               | 5,707        |
| Lincolnton C. H.....            | U. S. C. & G. S.....     | 944          |
| Lincolnton.....                 | Car. C. R. R.....        | 866          |
| Little Bald Mountain.....       | U. S. C. & G. S.....     | 5,217        |
| Little Pisgah.....              | U. S. C. & G. S.....     | 4,437        |
| Little River.....               | N. Carolina R. R.....    | 86           |
| Littleton.....                  | R. & G. R. R.....        | 380          |
| Lone Balsam.....                | Guyot.....               | 5,898        |
| Long Ridge.....                 | U. S. C. & G. S.....     | 1,194        |
| Lovelady.....                   | C. & L. N. G. R. R.....  | 1,250        |
| Lumberton C. H.....             | Car. C. R. R.....        | 135          |
| McLaurins.....                  | Car. C. R. R.....        | 238          |
| Macon.....                      | R. & G. R. R.....        | 370          |
| Manly.....                      | R. & A. R. R.....        | 450          |
| Marion.....                     | W. N. C. R. R.....       | 1,420        |
| Marville.....                   | Car. C. R. R.....        | 600          |
| Marshall.....                   | W. N. C. R. R.....       | 1,600        |
| Mebanks.....                    | N. Carolina R. R.....    | 600          |

| Station.                         | Authority.                   | Elevation.   |
|----------------------------------|------------------------------|--------------|
|                                  |                              | <i>Feet.</i> |
| Merry Oaks .....                 | R. & A. R. R .....           | 245          |
| Middleburgh .....                | R. & G. R. R .....           | 461          |
| Midway .....                     | R. & G. R. R .....           | 200          |
| Mill Brook .....                 | R. & G. R. R .....           | 304          |
| Mitchell, Mount .....            | Guyot .....                  | 6,582        |
| Mitchell's High Peak .....       | U. S. C. & G. S .....        | 6,688        |
| Moncure .....                    | R. & A. R. R .....           | 145          |
| Monroe .....                     | Car. C. R. R .....           | 586          |
| Morganton .....                  | W. N. C. R. R .....          | 1,140        |
| Moore .....                      | U. S. C. & G. S .....        | 572          |
| Morrisville .....                | N. Carolina R. R .....       | 308          |
| Moss Neck Station .....          | Car. C. R. R .....           | 159          |
| Negro Mountain .....             | U. S. C. & G. S .....        | 4,597        |
| Neuse .....                      | R. & G. R. R .....           | 270          |
| Neuse River .....                | N. Carolina R. R .....       | 112          |
| Newbern Depot .....              | A. & N. C. R. R .....        | 12           |
| New Hill .....                   | R. & A. R. R .....           | 332          |
| Newton .....                     | C. & L. N. G. R. R .....     | 1,070        |
| North Buffalo .....              | N. Carolina R. R .....       | 686          |
| Old Bald Mountain .....          | Guyot .....                  | 5,786        |
| Old Field Mountain .....         | Guyot .....                  | 5,100        |
| Osgood .....                     | R. & A. R. R .....           | 246          |
| Panther Knob .....               | Guyot .....                  | 5,359        |
| Pelham .....                     | P. A. L. R. R .....          | 742          |
| Perry Knob .....                 | Guyot .....                  | 5,026        |
| Pickens C. H. ....               | A. & F. B. V. R. R .....     | 1,093        |
| Pickens Nose .....               | U. S. C. & G. S .....        | 4,910        |
| Pilot Mountain .....             | U. S. C. & G. S .....        | 2,413        |
| Pineville .....                  | Charlotte C. & A. R. R ..... | 575          |
| Pinnacle Mountain .....          | U. S. C. & G. S .....        | 3,832        |
| Pisgah, Mount. ....              | U. S. C. & G. S .....        | 5,713        |
| Do .....                         | Guyot .....                  | 5,757        |
| Poore's Knob .....               | U. S. C. & G. S .....        | 2,680        |
| Potatoe Top .....                | Guyot .....                  | 6,393        |
| Princeton .....                  | N. Carolina R. R .....       | 160          |
| Raleigh .....                    | R. & A. R. R .....           | 316          |
| Do .....                         | .....                        | 303          |
| Red Banks .....                  | Car. C. R. R .....           | 176          |
| Reedy Patch Gap .....            | Car. C. R. R .....           | 2,242        |
| Reidsville .....                 | P. A. L. R. R .....          | 831          |
| Rich Fork .....                  | N. Carolina R. R .....       | 649          |
| Richland Balsam Mountain .....   | U. S. C. & G. S .....        | 6,370        |
| Do .....                         | Guyot .....                  | 6,425        |
| Ridgeway .....                   | R. & G. R. R .....           | 415          |
| Roan Mountain .....              | Guyot .....                  | 6,306        |
| Rockingham Depot .....           | Car. C. R. R .....           | 210          |
| Rockingham C. H. ....            | .....                        | 274          |
| Rockstand Knob .....             | Guyot .....                  | 6,002        |
| Rocky Face .....                 | Guyot .....                  | 6,031        |
| Rocky Knobs, S. peak .....       | Guyot .....                  | 5,306        |
| Rocky Trail Peak .....           | Guyot .....                  | 6,488        |
| Rosindale .....                  | Car. C. R. R .....           | 127          |
| Ruffin .....                     | P. A. L. R. R .....          | 710          |
| Saddleback Mountain .....        | U. S. C. & G. S .....        | 4,563        |
| Salem Depot .....                | N. W. N. C. R. R .....       | 854          |
| Salisbury .....                  | N. Carolina R. R .....       | 760          |
| Sanford .....                    | R. & A. R. R .....           | 320          |
| Shelby C. H. ....                | Car. C. R. R .....           | 875          |
| Shoe Heel .....                  | Car. C. R. R .....           | 194          |
| Silver Creek Knob .....          | U. S. C. & G. S .....        | 2,849        |
| Smithville, Signal Station ..... | U. S. Signal Office .....    | 34           |
| South Buffalo .....              | N. Carolina R. R .....       | 796          |
| Spruce Ridge Top .....           | Guyot .....                  | 6,076        |
| Standing Indian .....            | U. S. C. & G. S .....        | 5,495        |



| Station.                     | Authority.               | Elevation.   |
|------------------------------|--------------------------|--------------|
|                              |                          | <i>Feet.</i> |
| Standing Indian.....         | Guyot.....               | 5,840        |
| Statesville.....             | W. N. C. R. R.....       | 1,555        |
| Still House Gap.....         | W. N. C. R. R.....       | 1,315        |
| Sugar Loaf Mountain.....     | U. S. C. & G. S.....     | 3,978        |
| Tyron Mountain.....          | U. S. C. & G. S.....     | 3,249        |
| Do.....Northeast summit..... | U. S. C. & G. S.....     | 3,090        |
| Wake.....                    | R. & G. R. R.....        | 384          |
| Warm Springs.....            | W. N. C. R. R.....       | 1,325        |
| Warrenton.....               | R. & G. R. R.....        | 451          |
| Weldon.....                  | R. & G. R. R.....        | 72           |
| Western Bald Mountain.....   | Guyot.....               | 5,692        |
| Whitehearts.....             | N. W. N. C. R. R.....    | 976          |
| White Rock Ridge.....        | Guyot.....               | 5,528        |
| White Side Mountain.....     | U. S. C. & G. S.....     | 4,931        |
| Williamston.....             | A. & F. B. V. R. R.....  | 873          |
| Wilmington Depot.....        | Car. C. R. R.....        | 10           |
| Do.....N. W. Station.....    | .....                    | 50           |
| Do.....Signal Station.....   | U. S. Signal Office..... | 52           |
| Yeates' Knob.....            | Guyot.....               | 5,975        |
| Yellow Mountain.....         | Guyot.....               | 5,198        |
| Youngville.....              | R. & G. R. R.....        | 449          |

# OHIO.

| Station.                                                                               | Authority.                  | Elevation.   |
|----------------------------------------------------------------------------------------|-----------------------------|--------------|
|                                                                                        |                             | <i>Feet.</i> |
| Adams Mill, Lock 27 .....                                                              | O. & E. Canal .....         | 745          |
| Do.....Lock 28.....                                                                    | O. & E. Canal.....          | 735          |
| Do.....Lock 29.....                                                                    | O. & E. Canal.....          | 725          |
| Adams Mills.....                                                                       | P., C. & St. L. R. R.....   | 731          |
| Air-Line Junction .....                                                                | L. S. & M. S. R. R.....     | 607          |
| Akron .....                                                                            | N. Y., Pa. & O. R. R.....   | 1,230        |
| Aldine .....                                                                           | C. N. R. R.....             | 946          |
| Alexanderville .....                                                                   | C., C., C. & I. R. R.....   | 725          |
| Alliance.....                                                                          | P., Ft. W. & C. R. R.....   | 1,093        |
| Alton .....                                                                            | P., C. & St. L. R. R.....   | 928          |
| Amanda.....                                                                            | C. & Z. R. R.....           | 946          |
| Amblers.....                                                                           | B. & S. W. R. R.....        | 670          |
| Amelia.....                                                                            | Cin. & P. R. R.....         | 886          |
| Amherst.....                                                                           | L. S. & M. S. R. R.....     | 695          |
| Anderson.....                                                                          | M. & C. R. R.....           | 708          |
| Andover.....                                                                           | L. S. & M. S. R. R.....     | 1,096        |
| Do..Geodetic Station.....                                                              | U. S. Lake Survey.....      | 1,191        |
| Ansonia.....                                                                           | C., C., C. & I. R. R.....   | 1,006        |
| Antwerp.....                                                                           | T., W. & W. R. R.....       | 729          |
| Arcadia.....                                                                           | L. E. & L. R. R.....        | 806          |
| Arcanum.....                                                                           | I. B. & W. R. R.....        | 1,054        |
| Archbald.....                                                                          | L. S. & M. S. R. R.....     | 730          |
| Armstrong's Mills .....                                                                | B. & S. W. R. R.....        | 794          |
| Ashland.....                                                                           | N. Y., Pa. & O. R. R.....   | 1,079        |
| Ashley.....                                                                            | C., C., C. & I. R. R.....   | 985          |
| Ashtabula.....                                                                         | Ash. & P. R. R.....         | 688          |
| Ashtabula.....                                                                         | L. S. & M. S. R. R.....     | 648          |
| Ashville.....                                                                          | Scioto V. R. R.....         | 716          |
| Athens.....                                                                            | M. & C. R. R.....           | 654          |
| Do..B. M. on top of pier of bridge over<br>M. & C. R. R. and Hockhocking<br>River..... | U. S. C. & G. S.....        | 687          |
| Attica.....                                                                            | B. & P. C. R. R.....        | 964          |
| Aurora.....                                                                            | A. & G. W. R. R.....        | 1,104        |
| Austintown.....                                                                        | Ash. & P. R. R.....         | 815          |
| Austintown.....                                                                        | N. Y., Pa. & O. R. R.....   | 1,012        |
| Avesa.....                                                                             | C. N. R. R.....             | 689          |
| Avon.....                                                                              | A. & G. W. R. R.....        | 999          |
| Avon.....                                                                              | B., P. & C. R. R.....       | 747          |
| Avon.....                                                                              | C. N. R. R.....             | 848          |
| Avon.....                                                                              | C., Mt. V. & Del. R. R..... | 1,102        |
| Avon Mills.....                                                                        | C., T. V. & W. R. R.....    | 965          |
| Avon Mills.....                                                                        | C., T. V. & W. R. R.....    | 796          |
| Avon Mills.....                                                                        | B., P. & C. R. R.....       | 783          |
| Avon Mills Junction.....                                                               | P. C. & St. L. R. R.....    | 491          |
| Avon Mills.....                                                                        | Cin. & P. R. R.....         | 1,076        |
| Avon Mills Bridge.....                                                                 | L., S. & M. S. R. R.....    | 584          |
| Avon Mills.....                                                                        | B. & S. W. R. R.....        | 1,270        |
| Avon Mills Dam.....                                                                    | L., E. & L. R. R.....       | 863          |
| Avon Mills.....                                                                        | P., C. & St. L. R. R.....   | 808          |
| Avon Mills.....                                                                        | Cin. & P. R. R.....         | 941          |
| Avon Mills.....                                                                        | C., T., V. & W. R. R.....   | 860          |
| Avon Mills.....                                                                        | C., C., C. & I. R. R.....   | 941          |
| Avon Mills.....                                                                        | Cin. & P. R. R.....         | 655          |
| Avon Mills.....                                                                        | C., C., C. & I. R. R.....   | 1,216        |
| Avon Mills.....                                                                        | L. S. & M. S. R. R.....     | 755          |
| Avon Mills, wing-wall of 2d pier west end B. &<br>R. bridge over Ohio River .....      | U. S. C. & G. S.....        | 622          |

| Station.                            | Authority.                   | Elevation.   |
|-------------------------------------|------------------------------|--------------|
|                                     |                              | <i>Feet.</i> |
| Belpre, Hotel .....                 | M. & C. R. R. ....           | 630          |
| Berea .....                         | L. S. & M. S. R. R. ....     | 787          |
| Bessemer .....                      | C. & H. V. R. R. ....        | 681          |
| Bethel .....                        | B. & S. W. R. R. ....        | 1,255        |
| Big Poland .....                    | M. & C. R. R. ....           | 753          |
| Big Run .....                       | Scioto V. R. R. ....         | 555          |
| Big Sand Furnace .....              | M. & C. R. R. ....           | 712          |
| Black Creek .....                   | C., Mt. V. & Del. R. R. .... | 868          |
| Black River .....                   | C., T. V. & W. R. R. ....    | 611          |
| Blanchester .....                   | M. & C. R. R. ....           | 977          |
| Bloomdale .....                     | B. & P. C. R. R. ....        | 756          |
| Bloomfield .....                    | Ash. & P. R. R. ....         | 906          |
| Blue Ash .....                      | C. N. R. R. ....             | 859          |
| Bluffton .....                      | L. E. & L. R. R. ....        | 834          |
| Bolivar (lock) .....                | O. & E. Canal .....          | 907          |
| Boston .....                        | V. R. R. ....                | 668          |
| Botzums .....                       | V. R. R. ....                | 750          |
| Bowlersville .....                  | N. Y., Pa. & O. R. R. ....   | 966          |
| Braceville .....                    | N. Y., Pa. & O. R. R. ....   | 907          |
| Brachmans .....                     | Cin. & P. R. R. ....         | 713          |
| Branch Hill .....                   | P., C. & St. L. R. R. ....   | 590          |
| Bremen .....                        | C. & M. V. R. R. ....        | 831          |
| Bremen Summit (lock) .....          | Miami Canal .....            | 960          |
| Bricksville .....                   | V. R. R. ....                | 635          |
| Bridgeport .....                    | Cin. & P. R. R. ....         | 659          |
| Brier Hill .....                    | A. & P. R. R. ....           | 852          |
| Brinley's .....                     | P. C. & St. L. R. R. ....    | 1,124        |
| Bristolville .....                  | A. & P. R. R. ....           | 927          |
| Broadway .....                      | N. Y., Pa. & O. R. R. ....   | 1,032        |
| Brookville .....                    | P. C. & St. L. R. R. ....    | 1,033        |
| Brownhelm .....                     | L. S. & M. S. R. R. ....     | 640          |
| Brown's .....                       | Cin. & P. R. R. ....         | 683          |
| Do .....                            | P. C. & St. L. R. R. ....    | 1,060        |
| Do .....                            | I. B. & W. R. R. ....        | 855          |
| Bruce .....                         | C., T. Va. & W. R. R. ....   | 989          |
| Bruss .....                         | I. B. & W. R. R. ....        | 1,092        |
| Bryan .....                         | L. S. & M. S. R. R. ....     | 765          |
| Buchtel .....                       | C. & H. V. R. R. ....        | 687          |
| Buckskin .....                      | M. & C. R. R. ....           | 920          |
| Bucyrus .....                       | P., Ft. W. & C. R. R. ....   | 930          |
| Burbauk .....                       | N. Y., Pa. & O. R. R. ....   | 968          |
| Burghill .....                      | A. & G. W. R. R. ....        | 1,044        |
| Butler .....                        | C., T. V. & W. R. R. ....    | 869          |
| Cadiz Junction .....                | P. C. & St. L. R. R. ....    | 1,091        |
| Caldwell .....                      | M. & P. R. R. ....           | 736          |
| Do .....                            | S. V. R. R. ....             | 811          |
| Do .....                            | B. & S. W. R. R. ....        | 845          |
| Caledonia .....                     | C., C., C. & I. R. R. ....   | 906          |
| California .....                    | C. & P. R. R. ....           | 540          |
| Camden, Geodetic Station .....      | U. S. Lake Survey .....      | 891          |
| Camp Dennison .....                 | P. C. & St. L. R. R. ....    | 570          |
| Canal Dover .....                   | Cin. & P. R. R. ....         | 884          |
| Canal Fulton .....                  | C., T. V. & W. R. R. ....    | 947          |
| Canfield .....                      | N. Y., Pa. & O. R. R. ....   | 1,160        |
| Canton .....                        | V. R. R. ....                | 1,031        |
| Captina (mouth of Rocky Fork) ..... | B. & S. W. R. R. ....        | 778          |
| Carbon Hill .....                   | C. & H. V. R. R. ....        | 696          |
| Cardington .....                    | C., C., C. & I. R. R. ....   | 1,011        |
| Carey .....                         | S. D. & C. R. R. ....        | 818          |
| Carlisle .....                      | C. H. & D. R. R. ....        | 696          |
| Carroll .....                       | C. & H. V. R. R. ....        | 835          |
| Carthage .....                      | C., C., C. & I. R. R. ....   | 551          |
| Catawba .....                       | C., C., C. & I. R. R. ....   | 1,065        |
| Cecil .....                         | T. W. & W. R. R. ....        | 723          |

| Station.                                                                  | Authority.                     | Elevation.   |
|---------------------------------------------------------------------------|--------------------------------|--------------|
|                                                                           |                                | <i>Fest.</i> |
| Pedar Narrows .....                                                       | M. & P. R. R. ....             | 638          |
| Pedar Point .....                                                         | Cin. & P. R. R. ....           | 726          |
| Pedarville .....                                                          | P. C. & St. L. R. R. ....      | 1,035        |
| Pentreburgh (cross O. C. R. R.) .....                                     | C., Mt. V. & Del. R. R. ....   | 1,209        |
| Pentreton .....                                                           | B. & O. R. R. ....             | 873          |
| Pentreville .....                                                         | Cin. & P. R. R. ....           | 870          |
| Peylon .....                                                              | L. S. & M. S. R. R. ....       | 609          |
| Pamplon .....                                                             | Ash. & P. R. R. ....           | 932          |
| Perry Grove .....                                                         | Cin. & P. R. R. ....           | 847          |
| Phester, Geodetic Station .....                                           | U. S. Lake Survey .....        | 1,292        |
| Phester Park .....                                                        | C., C., C. & I. R. R. ....     | 508          |
| Picago Junction .....                                                     | B. P. & C. R. R. ....          | 901          |
| Pillicothe .....                                                          | D. & S. E. R. R. ....          | 638          |
| Do.... Pedestal, lamp-post, north side<br>of steps, front of court-house. | U. S. C. & G. S. ....          | 638          |
| Pippewa .....                                                             | C. T. V. & W. R. R. ....       | 1,056        |
| Purgh Hill .....                                                          | N. Y., Pa. & O. R. R. ....     | 1,017        |
| Pincinnati, Old depot .....                                               | C. I., St. L. & C. R. R. ....  | 501          |
| Do.... Plum street depot .....                                            | .....                          | 498          |
| Do.... Depot .....                                                        | C. S. R. R. ....               | 503          |
| Do.... Depot .....                                                        | O. & M. R. R. ....             | 494          |
| Do.... Depot .....                                                        | C. N. R. R. ....               | 545          |
| Do.... Depot .....                                                        | C. C. C. & I. R. R. ....       | 500          |
| Do.... Depot .....                                                        | C. H. & D. R. R. ....          | 509          |
| Do.... B. M. on west abutment M. &<br>C. R. R. bridge over Mill Cr.       | U. S. C. & G. S. ....          | 496          |
| Do.... B. M. on front water-table of<br>court-house.                      | U. S. C. & G. S. ....          | 547          |
| Do.... H. W. in Ohio River, 1858.                                         | .....                          | 484          |
| Do.... H. W. in Ohio River, 1847.                                         | M. & C. R. R. ....             | 511          |
| Do.... H. W. in Ohio River, 1832.                                         | M. & C. R. R. ....             | 511          |
| Do.... Signal Station .....                                               | U. S. Signal Office .....      | 620          |
| Do.... Upper level of canal .....                                         | Miami Canal .....              | 596          |
| Do.... L. W., Ohio River (city base).                                     | M. & C. R. R. ....             | 440          |
| Pircleville .....                                                         | C. & M. V. R. R. ....          | 720          |
| Do.... Main street crossing .....                                         | S. V. R. R. ....               | 682          |
| Do.... C. & M. V. R. R. ....                                              | .....                          | 690          |
| Claridon, Geodetic Station .....                                          | U. S. Lake Survey .....        | 1,366        |
| Clarksessville .....                                                      | C. & Z. R. R. ....             | 833          |
| Clarks .....                                                              | I., B. & W. R. R. ....         | 1,080        |
| Claysville .....                                                          | P. C. & St. L. R. R. ....      | 756          |
| Cleveland .....                                                           | A. & G. W. R. R. ....          | 598          |
| Do.... Union Depot .....                                                  | Cin. & P. R. R. ....           | 583          |
| Do.... Machine shop .....                                                 | Cin. & P. R. R. ....           | 629          |
| Do.... Euclid avenue .....                                                | Cin. & P. R. R. ....           | 668          |
| Do.... Newburgh .....                                                     | Cin. & P. R. R. ....           | 797          |
| Do.... Signal Station .....                                               | U. S. Signal Office .....      | 690          |
| Do.... Look 44, surface of water .....                                    | O. & E. Canal .....            | 586          |
| Cleves .....                                                              | C., I., St. L. & C. R. R. .... | 497          |
| Clinton .....                                                             | C., Mt. V. & Del. R. R. ....   | 959          |
| Clough Pike .....                                                         | C. & P. R. R. ....             | 890          |
| Clyde .....                                                               | L. S. & M. S. R. R. ....       | 691          |
| Coburg .....                                                              | B. P. & C. R. R. ....          | 787          |
| College Corner .....                                                      | C., H. & D. R. ....            | 990          |
| Collins .....                                                             | L. S. & M. S. R. R. ....       | 879          |
| Columbia .....                                                            | C., C., C. & I. R. R. ....     | 802          |
| Do.... .....                                                              | Cin. & P. R. R. ....           | 503          |
| Columbiana .....                                                          | P., Ft. W. & C. R. R. ....     | 1,113        |
| Columbus, Union Depot .....                                               | C. & H. V. R. R. ....          | 748          |
| Do.... Signal Station .....                                               | U. S. Signal Office .....      | 805          |
| Columbus Grove .....                                                      | C., H. & D. R. ....            | 752          |
| Condit. ....                                                              | C., Mt. V. & Del. R. R. ....   | 1,086        |
| Conesville .....                                                          | P., C. & St. L. R. R. ....     | 738          |
| Conneaut .....                                                            | L. S. & M. S. R. R. ....       | 652          |

| Station.                                                            | Authority.                   | Elevation.   |
|---------------------------------------------------------------------|------------------------------|--------------|
|                                                                     |                              | <i>Feet.</i> |
| Gretna .....                                                        | C., C., C. & I. R. R. ....   | 1,066        |
| Groveport .....                                                     | C. & H. V. R. R. ....        | 739          |
| Gumpfons Branch .....                                               | C. & Z. R. R. ....           | 898          |
| Hageman .....                                                       | C. N. R. R. ....             | 686          |
| Hamden .....                                                        | M. & C. R. R. ....           | 721          |
| Hamilton .....                                                      | C. H. & D. R. R. ....        | 597          |
| Do... (basin) .....                                                 | Miami Canal .....            | 610          |
| Hamler .....                                                        | B. P. & C. R. R. ....        | 723          |
| Hammondsville .....                                                 | Cin. & P. R. R. ....         | 688          |
| Hanging Rock .....                                                  | Scioto V. R. R. ....         | 557          |
| Do... (railroad crossing) .....                                     | Scioto V. R. R. ....         | 551          |
| Hanover .....                                                       | P. C. & St. L. R. R. ....    | 830          |
| Harbines .....                                                      | P. C. & St. L. R. R. ....    | 806          |
| Harbor .....                                                        | Ash. & P. R. R. ....         | 580          |
| Harmar .....                                                        | M. & C. R. R. ....           | 623          |
| Harper .....                                                        | C., C., C. & I. R. R. ....   | 1,299        |
| Harshmans .....                                                     | C., C., C. & I. R. R. ....   | 783          |
| Harts .....                                                         | C. T. V. & W. R. R. ....     | 693          |
| Haselton .....                                                      | Ash. & P. R. R. ....         | 831          |
| Havana .....                                                        | B. & O. R. R. ....           | 813          |
| Haverhill .....                                                     | S. V. R. R. ....             | 553          |
| Hawkers .....                                                       | P. C. & St. L. R. R. ....    | 915          |
| Haydensville .....                                                  | C. & H. V. R. R. ....        | 704          |
| Hayesville .....                                                    | Scioto V. R. R. ....         | 716          |
| Hazewood .....                                                      | C. N. R. R. ....             | 842          |
| Henderson .....                                                     | C., C. C. & I. R. R. ....    | 656          |
| Henderson .....                                                     | C., T. V. & W. R. R. ....    | 851          |
| Hennesseys .....                                                    | P. C. & St. L. R. R. ....    | 1,031        |
| Hicksville .....                                                    | B., P. & C. R. R. ....       | 762          |
| Higby .....                                                         | Scioto V. R. R. ....         | 594          |
| Hillsborough, at eastern terminus of Hills-<br>borough Branch ..... | M. & C. R. R. ....           | 1,075        |
| Holgate .....                                                       | B., P. & C. R. R. ....       | 722          |
| Holland .....                                                       | L., S. & M. S. R. R. ....    | 641          |
| Hollandsburgh .....                                                 | I., B. & W. R. R. ....       | 1,150        |
| Holloway .....                                                      | C., T. V. & W. R. R. ....    | 911          |
| Homeworth .....                                                     | C. & P. R. R. ....           | 1,150        |
| Hookers .....                                                       | C. & H. V. R. R. ....        | 83'          |
| Hopetown .....                                                      | Scioto V. R. R. ....         | 675          |
| Houston .....                                                       | C., C. C. & I. R. R. ....    | 959          |
| Howard .....                                                        | C., Mt. V. & Del. R. R. .... | 900          |
| Hoyt's Corners .....                                                | B., P. & C. R. R. ....       | 721          |
| Hubbard .....                                                       | A. & G. W. R. R. ....        | 937          |
| Hudson .....                                                        | Cin. & P. R. R. ....         | 1,053        |
| Huron .....                                                         | L. S. & M. S. R. R. ....     | 598          |
| Iberia .....                                                        | C., C. C. & I. R. R. ....    | 1,156        |
| Idlewild .....                                                      | C. N. R. R. ....             | 700          |
| Independence .....                                                  | V. R. R. ....                | 606          |
| Do... (Lock) .....                                                  | O. & E. Canal .....          | 602          |
| Ironton (Ironton R. R., last crossing) .....                        | Scioto V. R. R. ....         | 550          |
| Irwin .....                                                         | C., C. C. & I. R. R. ....    | 1,012        |
| Do .....                                                            | B. & S. W. R. R. ....        | 932          |
| Ivanhoe .....                                                       | C. N. R. R. ....             | 664          |
| Jackson .....                                                       | L. E. & L. R. R. ....        | 761          |
| Jacobsburgh .....                                                   | B. & S. W. R. R. ....        | 1,330        |
| Jamestown .....                                                     | D. & S. E. R. R. ....        | 1,071        |
| Jefferson .....                                                     | L. S. & M. S. R. R. ....     | 941          |
| Jerusalem .....                                                     | B. & S. W. R. R. ....        | 1,300        |
| Johnson's .....                                                     | Scioto V. R. R. ....         | 554          |
| Jones' Station .....                                                | C., H. & D. R. R. ....       | 672          |
| Judds .....                                                         | Cin. & P. R. R. ....         | 884          |
| Justus .....                                                        | C., T. V. & W. R. R. ....    | 994          |
| Karsaa .....                                                        | L. E. & L. R. R. ....        | 731          |
| Kelly's Island, Geodetic Station .....                              | U. S. Lake Survey .....      | 614          |

| Station.                                         | Authority.                                                                | Elevation.   |
|--------------------------------------------------|---------------------------------------------------------------------------|--------------|
|                                                  |                                                                           | <i>Feet.</i> |
| Kennard .....                                    | N. Y., Pa. & O. R. R .....                                                | 1, 174       |
| Kennedy .....                                    | C. N. R. R .....                                                          | 743          |
| Kensington .....                                 | Cin. & P. R. R .....                                                      | 1, 130       |
| Kent .....                                       | N. Y., Pa. & Ohio R. R .....                                              | { 1, 050     |
|                                                  |                                                                           | { 1, 273     |
| Kenton .....                                     | S. D. & C. R. R .....                                                     | 1, 015       |
| Kessler .....                                    | I., B. & W. R. R .....                                                    | 925          |
| Kings .....                                      | P., C. & St. L. R. R .....                                                | 612          |
| Kingston .....                                   | N. Y., Pa. & O. R. R .....                                                | 1, 097       |
| Do .....                                         | Scioto V. R. R .....                                                      | 770          |
| Kingsville .....                                 | L. S. & M. S. R. R .....                                                  | 672          |
| Kiunkiuick .....                                 | Scioto Valley R. R .....                                                  | 672          |
| Kipton .....                                     | L. S. & M. S. R. R .....                                                  | 853          |
| Kneisley's .....                                 | C., C. C. & I. R. R .....                                                 | 802          |
| Krumwoy .....                                    | V. R. R .....                                                             | 1, 051       |
| Kyles .....                                      | C., C. C. & I. R. R .....                                                 | 718          |
| Do .....                                         | Cin. & P. R. R .....                                                      | 859          |
| Lafferty .....                                   | C., T. V. & W. R. R .....                                                 | 1, 027       |
| La Grange .....                                  | Cin. & P. R. R .....                                                      | 679          |
| Do .....                                         | C., C. C. & I. R. R .....                                                 | 828          |
| Laanaster .....                                  | C. & M. V. R. R .....                                                     | 854          |
| La Rue .....                                     | C., C. C. & I. R. R .....                                                 | 926          |
| Laughlins .....                                  | Cin. & P. R. R .....                                                      | 949          |
| Laura .....                                      | I., B. & W. R. R .....                                                    | 970          |
| Lawrence Junction .....                          | Ash. & P. R. R .....                                                      | 775          |
| Leavittsburgh .....                              | A. & G. W. R. R .....                                                     | 896          |
| Do .....                                         | crossing of main line & Mah. Div .....                                    |              |
| Lebanon .....                                    | A. & G. W. R. R .....                                                     | 907          |
| Leesburg .....                                   | C. N. R. R .....                                                          | 709          |
| Leetonia .....                                   | M. & C. R. R .....                                                        | 1, 030       |
| Do .....                                         | P., Ft. W. & C. R. R .....                                                | 1, 016       |
| Leipsic .....                                    | N. Y., Pa. & O. R. R .....                                                | 1, 018       |
| Leon .....                                       | C., H. & D. R. R .....                                                    | 746          |
| Levering .....                                   | L. S. & M. S. R. R .....                                                  | 1, 114       |
| Lexington .....                                  | C., C. C. & I. R. R .....                                                 | 1, 056       |
| Liberty .....                                    | C. & Z. R. R .....                                                        | 896          |
| Do. (Tank) .....                                 | T., W. & W. R. R .....                                                    | 683          |
| Lima .....                                       | N. Y., Pa. & O. R. R .....                                                | 1, 071       |
| Do. crossing O. & M. & P. Ft. W. & C. R. R ..... | C. H. & D. R. R .....                                                     | 859          |
| Do. crossing D. and M. Railroad .....            | L. E. & L. R. R .....                                                     | 885          |
| Limaville .....                                  | P., Ft. W. & C. R. R .....                                                | 779          |
| Lindsey .....                                    | Cin. & P. R. R .....                                                      | 1, 098       |
| Linwood .....                                    | L. S. & M. S. R. R .....                                                  | 622          |
| Little Hocking .....                             | P., C. & St. L. R. R .....                                                | 503          |
| Little Mountain, Geodetic Station .....          | M. & C. R. R .....                                                        | 635          |
| Lockbourne .....                                 | U. S. Lake Survey .....                                                   | 1, 248       |
| Locke .....                                      | Scioto V. R. R .....                                                      | 720          |
| Lockport (Lock) .....                            | B. P. & C. R. R .....                                                     | 881          |
| Lockville .....                                  | O. & E. Canal .....                                                       | 867          |
| Locust Switch .....                              | C. & H. V. R. R .....                                                     | 797          |
| Lodi .....                                       | N. Y., Pa. & O. R. R .....                                                | 1, 053       |
| Logan .....                                      | S. D. & C. R. R .....                                                     | 855          |
| London .....                                     | C. & H. V. R. R .....                                                     | 729          |
| Londonderry .....                                | P., C. & St. L. R. R .....                                                | 1, 049       |
| Londonville .....                                | M. & C. R. R .....                                                        | 625          |
| Long's Summit .....                              | P., Ft. W. & C. R. R .....                                                | 975          |
| Loveland .....                                   | N. Y., Pa. & O. R. R .....                                                | 853          |
| Do .....                                         | C. & Z. R. R .....                                                        | 605          |
| Do .....                                         | B. M. on east abutment M. & C. R. R. bridge over Little Miami River ..... |              |
| Do .....                                         | U. S. C. & G. S. ....                                                     | 582          |
| Do .....                                         | B. M. on east abutment M. & C. R. R. bridge over Little Miami River ..... |              |
| Do .....                                         | P. C. & St. L. R. R .....                                                 | 581          |

| Station.                                                    | Authority.                  | Elevation.   |
|-------------------------------------------------------------|-----------------------------|--------------|
|                                                             |                             | <i>Feet.</i> |
| Loveland crossing Little Miami River.....                   | M. & C. R. R.....           | 592          |
| Do...crossing Little Miami Railroad..                       | M. & C. R. R.....           | 594          |
| Lowell.....                                                 | N. C. & B. V. R. R.....     | 826          |
| Lucas.....                                                  | P., Ft. W. & C. R. R.....   | 1,091        |
| Lucasville.....                                             | Scioto V. R. R.....         | 556          |
| Ludlow Falls.....                                           | I. B. & W. R. R.....        | 900          |
| McCoys.....                                                 | Cin. & P. R. R.....         | 684          |
| Macedonia.....                                              | Cin. & P. R. R.....         | 983          |
| McLuney.....                                                | C. & Z. R. R.....           | 905          |
| Madison.....                                                | L. S. & M. S. R. R.....     | 715          |
| Mahoning.....                                               | A. & G. W. R. R.....        | 943          |
| Do...summit.....                                            | Cin. & P. R. R.....         | 1,200        |
| Malvern.....                                                | Cin. & P. R. R.....         | 998          |
| Mauchester.....                                             | P., C. & St. L. R. R.....   | 1,094        |
| Mansfield.....                                              | B. & O. R. R.....           | 1,154        |
| Do.....                                                     | P., Ft. W. & C. R. R.....   | 1,151        |
| Do...B., Ft. W. & C. R. R. crossing.....                    | N. Y., Pa. & O. R. R.....   | 1,155        |
| Do...B. & O. R. R. crossing.....                            | N. Y., Pa. & O. R. R.....   | 1,159        |
| Mantua.....                                                 | A. & G. W. R. R.....        | 1,111        |
| Marietta, crossing of Muskingum River...                    | M. & C. R. R.....           | 640          |
| Do...L. W. in Muskingum River.....                          | M. & C. R. R.....           | 582          |
| Do...Wayne street depot.....                                | M. & P. R. R.....           | 611          |
| Do...Fourth street depot.....                               | M. & P. R. R.....           | 616          |
| Marion.....                                                 | C., C. C. & I. R. R.....    | 979          |
| Do...C., C. C. & I. R. R. crossing.....                     | N. Y., Pa. & O. R. R.....   | 965          |
| Mark Center.....                                            | B., P. & C. R. R.....       | 731          |
| Marksburgh.....                                             | M. & P. R. R.....           | 680          |
| Marshfield.....                                             | M. & C. R. R.....           | 826          |
| Martin.....                                                 | L. S. & M. S. R. R.....     | 606          |
| Martin's Ferry.....                                         | Cin. & P. R. R.....         | 659          |
| Martinsville.....                                           | M. & C. R. R.....           | 1,043        |
| Do...B. M. on east abutment of M. & C.<br>R. R. bridge..... | U. S. C. & G. S.....        | 1,057        |
| Marysville.....                                             | C., C. C. & I. R. R.....    | 999          |
| Mason.....                                                  | C. N. R. R.....             | 827          |
| Massillon.....                                              | C., T., V. & W. R. R.....   | 944          |
| Do.....                                                     | P., Ft. W. & C. R. R.....   | 954          |
| Do.....                                                     | Wheeling & L. E. R. R.....  | 962          |
| Do.....                                                     | C., T., V. & W. R. R.....   | 963          |
| Do...(Lock 5).....                                          | O. & E. Canal.....          | 940          |
| Do...(Lock 5a).....                                         | O. & E. Canal.....          | 934          |
| Masterville.....                                            | P., C. & St. L. R. R.....   | 936          |
| Mauds.....                                                  | C., C. C. & I. R. R.....    | 759          |
| Maumee.....                                                 | T. W. & W. R. R.....        | 637          |
| Mechanicsburg.....                                          | C., C. C. & I. R. R.....    | 1,068        |
| Medina.....                                                 | C., T., V. & W. R. R.....   | 1,066        |
| Melbern.....                                                | L. S. & M. S. R. R.....     | 841          |
| Mentor.....                                                 | L. S. & M. S. R. R.....     | 650          |
| Mesopotamia, Geodetic Station.....                          | U. S. Lake Survey.....      | 1,172        |
| Miami City.....                                             | P., C. & St. L. R. R.....   | 744          |
| Miamisburgh.....                                            | C., C. C. & I. R. R.....    | 714          |
| Do.....                                                     | C., H. & D. R. R.....       | 649          |
| Miamiville.....                                             | C. & Z. R. R.....           | 592          |
| Do.....                                                     | P., C. & St. L. R. R.....   | 580          |
| Middle Bass, Geodetic Station.....                          | U. S. Lake Survey.....      | 581          |
| Middleton.....                                              | C., C. C. & I. R. R.....    | 667          |
| Do.....                                                     | C., H. & D. R. R.....       | 649          |
| Milford.....                                                | C. & Z. R. R.....           | 577          |
| Milford.....                                                | C. C. C. & I. R. R.....     | 996          |
| Do.....                                                     | P., C. & St. L. R. R.....   | 552          |
| Millbury Junction.....                                      | L. S. & M. S. R. R.....     | 615          |
| Miller's.....                                               | P., C. & St. L. R. R.....   | 1,007        |
| Millersburg.....                                            | C., Mt. V. & Del. R. R..... | 816          |
| Millville.....                                              | C. & H. V. R. R.....        | 752          |

| Station.                                     | Authority.                   | Elevation.   |
|----------------------------------------------|------------------------------|--------------|
|                                              |                              | <i>Feet.</i> |
| nd .....                                     | N. Y., Pa. & O. R. R .....   | 1,174        |
| ly .....                                     | C. N. R. R .....             | 743          |
| gton .....                                   | Cin. & P. R. R .....         | 1,130        |
| .....                                        | N. Y., Pa. & Ohio R. R ..... | { 1,050      |
| .....                                        | .....                        | { 1,273      |
| .....                                        | S. D. & C. R. R .....        | 1,015        |
| .....                                        | I., B. & W. R. R .....       | 925          |
| .....                                        | P., C. & St. L. R. R .....   | 612          |
| on .....                                     | N. Y., Pa. & O. R. R .....   | 1,097        |
| .....                                        | Scioto V. R. R .....         | 770          |
| ille .....                                   | L. S. & M. S. R. R .....     | 672          |
| innick .....                                 | Scioto Valley R. R .....     | 672          |
| .....                                        | L. S. & M. S. R. R .....     | 853          |
| oy's .....                                   | C., C. C. & I. R. R .....    | 802          |
| roy .....                                    | V. R. R .....                | 1,051        |
| .....                                        | C., C. C. & I. R. R .....    | 718          |
| .....                                        | Cin. & P. R. R .....         | 859          |
| y .....                                      | C., T. V. & W. R. R .....    | 1,027        |
| ange .....                                   | Cin. & P. R. R .....         | 679          |
| .....                                        | C., C. C. & I. R. R .....    | 828          |
| ster .....                                   | C. & M. V. R. R .....        | 854          |
| .....                                        | C., C. C. & I. R. R .....    | 926          |
| lins .....                                   | Cin. & P. R. R .....         | 949          |
| .....                                        | I., B. & W. R. R .....       | 970          |
| nce Junction .....                           | Ash. & P. R. R .....         | 775          |
| tsburgh .....                                | A. & G. W. R. R .....        | 895          |
| ..... crossing of main line & Mah.           |                              |              |
| Div .....                                    | A. & G. W. R. R .....        | 907          |
| on .....                                     | C. N. R. R .....             | 709          |
| rg .....                                     | M. & C. R. R .....           | 1,030        |
| ia .....                                     | P., Ft. W. & C. R. R .....   | 1,016        |
| ..... P., F. W. & C. crossing .....          | N. Y., Pa. & O. R. R .....   | 1,018        |
| .....                                        | C., H. & D. R. R .....       | 746          |
| .....                                        | L. S. & M. S. R. R .....     | 1,114        |
| ng .....                                     | C., C. C. & I. R. R .....    | 1,056        |
| gton .....                                   | C. & Z. R. R .....           | 896          |
| y .....                                      | T., W. & W. R. R .....       | 683          |
| ..... (Tank) .....                           | N. Y., Pa. & O. R. R .....   | 1,071        |
| .....                                        | C. H. & D. R. R .....        | 859          |
| crossing O. & M. & P. Ft. W. & C. R. R ..... | L. E. & L. R. R .....        | 885          |
| crossing D. and M. Railroad .....            | P., Ft. W. & C. R. R .....   | 779          |
| ille .....                                   | Cin. & P. R. R .....         | 1,098        |
| y .....                                      | L. S. & M. S. R. R .....     | 622          |
| od .....                                     | P., C. & St. L. R. R .....   | 503          |
| Hocking .....                                | M. & C. R. R .....           | 635          |
| Mountain, Geodetic Station .....             | U. S. Lake Survey .....      | 1,248        |
| ourne .....                                  | Scioto V. R. R .....         | 720          |
| .....                                        | B. P. & C. R. R .....        | 881          |
| ort (Lock) .....                             | O. & E. Canal .....          | 867          |
| ille .....                                   | C. & H. V. R. R .....        | 797          |
| Switch .....                                 | N. Y., Pa. & O. R. R .....   | 1,053        |
| .....                                        | S. D. & C. R. R .....        | 855          |
| .....                                        | C. & H. V. R. R .....        | 729          |
| n .....                                      | P., C. & St. L. R. R .....   | 1,049        |
| nderry .....                                 | M. & C. R. R .....           | 625          |
| nville .....                                 | P., Ft. W. & C. R. R .....   | 975          |
| Summit .....                                 | N. Y., Pa. & O. R. R .....   | 883          |
| nd .....                                     | C. & Z. R. R .....           | 605          |
| ..... B. M. on east abutment M. & C.         |                              |              |
| ..... R. R. bridge over Little Miami         |                              |              |
| ..... River .....                            | U. S. C. & G. S. ....        | 582          |
| ..... B. M. on east abutment M. & C.         |                              |              |
| ..... R. R. bridge over Little Miami         |                              |              |
| ..... River .....                            | P. C. & St. L. R. R .....    | 581          |



| Station.                                                     | Authority.                  | Elevat |
|--------------------------------------------------------------|-----------------------------|--------|
| Loveland crossing Little Miami River.....                    | M. & C. R. R.....           | f      |
| Do... crossing Little Miami Railroad..                       | M. & C. R. R.....           |        |
| Lowell.....                                                  | N. C. & B. V. R. R.....     |        |
| Lucas.....                                                   | P., Ft. W. & C. R. R.....   | 1,     |
| Lucasville.....                                              | Scioto V. R. R.....         |        |
| Ludlow Falls.....                                            | I. B. & W. R. R.....        |        |
| McCoys.....                                                  | Cin. & P. R. R.....         |        |
| Macedonia.....                                               | Cin. & P. R. R.....         |        |
| McLuney.....                                                 | C. & Z. R. R.....           |        |
| Madison.....                                                 | L. S. & M. S. R. R.....     |        |
| Mahoning.....                                                | A. & G. W. R. R.....        |        |
| Do... summit.....                                            | Cin. & P. R. R.....         | 1,     |
| Malvern.....                                                 | Cin. & P. R. R.....         |        |
| Manchester.....                                              | P., C. & St. L. R. R.....   | 1,     |
| Mansfield.....                                               | B. & O. R. R.....           | 1,     |
| Do.....                                                      | P., Ft. W. & C. R. R.....   | 1,     |
| Do... B., Ft. W. & C. R. R. crossing.....                    | N. Y., Pa. & O. R. R.....   | 1,     |
| Do... B. & O. R. R. crossing.....                            | N. Y., Pa. & O. R. R.....   | 1,     |
| Mantua.....                                                  | A. & G. W. R. R.....        | 1,     |
| Marietta, crossing of Muskingum River.....                   | M. & C. R. R.....           |        |
| Do... L. W. in Muskingum River.....                          | M. & C. R. R.....           |        |
| Do... Wayne street depot.....                                | M. & P. R. R.....           |        |
| Do... Fourth street depot.....                               | M. & P. R. R.....           |        |
| Marion.....                                                  | C., C. C. & I. R. R.....    |        |
| Do... C., C. C. & I. R. R. crossing.....                     | N. Y., Pa. & O. R. R.....   |        |
| Mark Center.....                                             | B., P. & C. R. R.....       |        |
| Marksburgh.....                                              | M. & P. R. R.....           |        |
| Marshfield.....                                              | M. & C. R. R.....           |        |
| Martin.....                                                  | L. S. & M. S. R. R.....     |        |
| Martin's Ferry.....                                          | Cin. & P. R. R.....         |        |
| Martinsville.....                                            | M. & C. R. R.....           | 1,     |
| Do... B. M. on east abutment of M. & C.<br>R. R. bridge..... | U. S. C. & G. S.....        | 1,     |
| Marysville.....                                              | C., C. C. & I. R. R.....    |        |
| Mason.....                                                   | C. N. R. R.....             |        |
| Massillon.....                                               | C., T., V. & W. R. R.....   |        |
| Do.....                                                      | P., Ft. W. & C. R. R.....   |        |
| Do.....                                                      | Wheeling & L. E. R. R.....  |        |
| Do.....                                                      | C., T., V. & W. R. R.....   |        |
| Do... (Lock 5).....                                          | O. & E. Canal.....          |        |
| Do... (Lock 5a).....                                         | O. & E. Canal.....          |        |
| Masterville.....                                             | P., C. & St. L. R. R.....   |        |
| Maude.....                                                   | C., C. C. & I. R. R.....    |        |
| Manmee.....                                                  | T. W. & W. R. R.....        |        |
| Mechanicsburg.....                                           | C., C. C. & I. R. R.....    | 1,     |
| Medina.....                                                  | C., T., V. & W. R. R.....   | 1,     |
| Melbern.....                                                 | L. S. & M. S. R. R.....     |        |
| Mentor.....                                                  | L. S. & M. S. R. R.....     |        |
| Mesopotamia, Geodetic Station.....                           | U. S. Lake Survey.....      | 1,     |
| Miami City.....                                              | P., C. & St. L. R. R.....   |        |
| Miamisburgh.....                                             | C., C. C. & I. R. R.....    |        |
| Do.....                                                      | C., H. & D. R. R.....       |        |
| Miamiville.....                                              | C. & Z. R. R.....           |        |
| Do.....                                                      | P., C. & St. L. R. R.....   |        |
| Middle Bass, Geodetic Station.....                           | U. S. Lake Survey.....      |        |
| Middleton.....                                               | C., C. C. & I. R. R.....    |        |
| Do.....                                                      | C., H. & D. R. R.....       |        |
| Milford.....                                                 | C. & Z. R. R.....           |        |
| Milford.....                                                 | C. C. C. & I. R. R.....     |        |
| Do.....                                                      | P., C. & St. L. R. R.....   |        |
| Millbury Junction.....                                       | L. S. & M. S. R. R.....     |        |
| Miller's.....                                                | P., C. & St. L. R. R.....   | 1,     |
| Millersburg.....                                             | C., Mt. V. & Del. R. R..... |        |
| Millville.....                                               | C. & H. V. R. R.....        |        |

| Station.                                      | Authority.                | Elevation.   |
|-----------------------------------------------|---------------------------|--------------|
|                                               |                           | <i>Feet.</i> |
| Quincy.....                                   | C., C. C. & I. R. R.....  | 1,050        |
| Randall.....                                  | A. & G. W. R. R.....      | 1,046        |
| Ravenna.....                                  | Cin. & P. R. R.....       | 1,103        |
| Rawson.....                                   | L. E. & L. R. R.....      | 821          |
| Raysville.....                                | M. & C. R. R.....         | 636          |
| Red Bank.....                                 | P. C. & St. L. R. R.....  | 501          |
| Reese's.....                                  | Scioto V. R. R.....       | 735          |
| Reeseville.....                               | C. & Z. R. R.....         | 1,066        |
| Republic.....                                 | B., P. & C. R. R.....     | 885          |
| Richland.....                                 | P., Ft. W. & C. R. R..... | 1,201        |
| Richmond.....                                 | P. C. & St. L. R. R.....  | 968          |
| Do.....                                       | L. S. & M. S. R. R.....   | 1,114        |
| Richwood.....                                 | N. Y., Pa. & O. R. R..... | 948          |
| Ridgefield.....                               | B., P. & C. R. R.....     | 779          |
| Ridgeway.....                                 | C., C. C. & I. R. R.....  | 1,069        |
| Rochester.....                                | C., C. C. & I. R. R.....  | 935          |
| Rook Creek.....                               | Ash. & P. R. R.....       | 846          |
| Rockport.....                                 | L. S. & M. S. R. R.....   | 884          |
| Do...Geodetic Station.....                    | U. S. Lake Survey.....    | 781          |
| Rook Run.....                                 | P., C. & St. L. R. R..... | 758          |
| Robbins.....                                  | N. Y., Pa. & O. R. R..... | 982          |
| Rome.....                                     | Ash. & P. R. R.....       | 884          |
| Rootstown.....                                | Cin. & P. R. R.....       | 1,123        |
| Roseville.....                                | C. & Z. R. R.....         | 783          |
| Royalton, Geodetic Station.....               | U. S. Lake Survey.....    | 1,272        |
| Rush Run.....                                 | Cin. & P. R. R.....       | 679          |
| Rushsylvania.....                             | C., C. C. & I. R. R.....  | 1,236        |
| Russell.....                                  | C., T. V. & W. R. R.....  | 969          |
| Do...(C. T. V. & W. R. R crossing).....       | N. Y., Pa. & O. R. R..... | 973          |
| Russells.....                                 | P., C. & St. L. R. R..... | 501          |
| Russia.....                                   | C., C. C. & I. R. R.....  | 971          |
| Sabina.....                                   | C. & M. V. R. R.....      | 1,066        |
| St. Marys.....                                | Miami Canal.....          | 864          |
| Salem.....                                    | M. & P. R. R.....         | 682          |
| Do.....                                       | P., Ft. W. & C. R. R..... | 1,173        |
| Salina.....                                   | C. & H. V. R. R.....      | 659          |
| Salinesville.....                             | Cin. & P. R. R.....       | 879          |
| Salt Creek.....                               | D. & S. E. R. R.....      | 588          |
| Sandusky, City base.....                      | City Engineer.....        | 587          |
| Do...depot.....                               | L. S. & M. S. R. R.....   | 593          |
| Do...depot.....                               | S., D. & C. R. R.....     | 598          |
| Do...depot.....                               | B. & O. R. R.....         | 609          |
| Do...Geodetic Station.....                    | U. S. Lake Survey.....    | 632          |
| Do...Signal Station.....                      | U. S. Signal Office.....  | 639          |
| Sargents.....                                 | Scioto V. R. R.....       | 577          |
| Saville.....                                  | C., T. V. & W. R. R.....  | 986          |
| Saybrook.....                                 | L. S. & M. S. R. R.....   | 651          |
| Schooleys.....                                | M. & C. R. R.....         | 666          |
| Sciotoville (junction with M. & C. R. R)..... | Scioto V. R. R.....       | 546          |
| Selma.....                                    | P., C. & St. L. R. R..... | 1,083        |
| Seymours.....                                 | Ash. & P. R. R.....       | 797          |
| Shakerton.....                                | C. N. R. R.....           | 745          |
| Sharon.....                                   | C., C., C. & I. R. R..... | 601          |
| Sharonville.....                              | Scioto V. R. R.....       | 597          |
| Shawville.....                                | L. S. & M. S. R. R.....   | 744          |
| Shelby.....                                   | B. & O. R. R.....         | 1,088        |
| Do Junction.....                              | B. & O. R. R.....         | 1,086        |
| Shiloh.....                                   | C., C., C. & I. R. R..... | 1,080        |
| Shoups.....                                   | P., C. & St. L. R. R..... | 831          |
| Sidney.....                                   | C., C., C. & I. R. R..... | 969          |
| Silver Creek.....                             | C., T. V. & W. R. R.....  | 948          |
| Do.....                                       | N. Y., Pa. & O. R. R..... | 1,392        |
| Do.....(summit).....                          | D. & S. E. R. R.....      | 1,118        |
| Silverton.....                                | C. N. R. R.....           | 825          |

| Station.                               | Authority.                    | Eleva |
|----------------------------------------|-------------------------------|-------|
| Oak Harbor .....                       | L. S. & M. S. R. R. ....      |       |
| Oberlin .....                          | L. S. & M. S. R. R. ....      |       |
| Odell, Lake .....                      | Toner .....                   |       |
| Oldtown .....                          | P., C. St. L. & P. R. R. .... |       |
| Old Portage .....                      | O. & E. Canal .....           |       |
| Olive Branch .....                     | Cin. & P. R. R. ....          |       |
| Olmstead Falls .....                   | L. S. & M. S. R. R. ....      |       |
| Do.....Geodetic Station.....           | U. S. Lake Survey.....        |       |
| Olmstead .....                         | C., C. C. & I. R. R. ....     |       |
| Oneida .....                           | Cin. & P. R. R. ....          | 1     |
| Ontario .....                          | N. Y., Pa. & O. R. R. ....    | 1     |
| Orangeville .....                      | A. & G. W. R. R. ....         |       |
| Orbiston .....                         | C. & H. V. R. R. ....         |       |
| Oreville .....                         | C. & H. V. R. R. ....         |       |
| Orrville .....                         | C., Mt. V. & Del. R. R. ....  | 1     |
| Do.....crossing C. & Mt. V. R. R.....  | P., Ft. W. & C. R. R. ....    | 1     |
| Orwell .....                           | N. C. & B. V. R. R. ....      |       |
| Osborn .....                           | C., C. C. & I. R. R. ....     |       |
| Osborne .....                          | N. Y., Pa. & O. R. R. ....    |       |
| Ostrander .....                        | C., C. C. & I. R. R. ....     |       |
| Ottawa .....                           | C., H. & D. R. R. ....        |       |
| Oxford .....                           | C., H. & D. R. R. ....        |       |
| Do.....                                | P., C. & St. L. R. R. ....    |       |
| Ozark .....                            | B. & S. W. R. R. ....         | 1     |
| Painesville .....                      | L. S. & M. S. R. R. ....      |       |
| Palestine .....                        | P., Ft. W. & C. R. R. ....    | 1     |
| Pasco .....                            | C., T. V. & W. R. R. ....     |       |
| Patterson .....                        | C., T. V. & W. R. R. ....     |       |
| Pauls .....                            | C., T. V. & W. R. R. ....     |       |
| Pemberton .....                        | C., C. C. & I. R. R. ....     | 1     |
| Pendleton .....                        | P. C. & St. L. R. R. ....     |       |
| Peninsula .....                        | V. R. R. ....                 |       |
| Do.....(Lock).....                     | O. & E. Canal .....           |       |
| Peoria .....                           | N. Y., Pa. & O. R. R. ....    | 1     |
| Perry .....                            | L. S. & M. S. R. R. ....      |       |
| Perrysburgh .....                      | C. H. & D. R. R. ....         |       |
| Petersburgh Coal Grove P. O. ....      | Scioto V. R. R. ....          |       |
| Pettisville .....                      | L. S. & M. S. R. R. ....      |       |
| Phalanx .....                          | A. & G. W. R. R. ....         |       |
| Pierce's .....                         | P. C. & St. L. R. R. ....     | 1     |
| Pike .....                             | N. Y., Pa. & O. R. R. ....    |       |
| Piketon .....                          | Scioto V. R. R. ....          |       |
| Pilcher .....                          | M. & C. R. R. ....            |       |
| Piqua .....                            | C., H. & D. R. R. ....        |       |
| Plainville .....                       | C. & Z. R. R. ....            |       |
| Do.....                                | P. C. & St. L. R. R. ....     |       |
| Pleasant Plains .....                  | M. & C. R. R. ....            |       |
| Pleasant Ridge .....                   | C. N. R. R. ....              |       |
| Plymouth .....                         | B. & O. R. R. ....            |       |
| Do.....                                | L. S. & M. S. R. R. ....      |       |
| Polk .....                             | N. Y., Pa. & O. R. R. ....    | 1     |
| Pond .....                             | A. & G. W. R. R. ....         | 1     |
| Pontiac .....                          | B. & O. R. R. ....            |       |
| Port Clinton .....                     | L. S. & M. S. R. R. ....      |       |
| Portland .....                         | Cin. & P. R. R. ....          |       |
| Portsmouth (S. V. Depot) .....         | Scioto V. R. R. ....          |       |
| Do.....junction with M. & C. R. R..... | Scioto V. R. R. ....          |       |
| Do.....O. & R. R. R.....               | Scioto V. R. R. ....          |       |
| Port Washington .....                  | P. C. & St. L. R. R. ....     |       |
| Do.....(Lock).....                     | O. & E. Canal .....           |       |
| Pottersburgh .....                     | N. Y., Pa. & O. R. R. ....    | 1     |
| Prouts .....                           | B. & O. R. R. ....            |       |
| Providence (Lock) .....                | O. & E. Canal .....           |       |
| Quakertown .....                       | Ash. & P. R. R. ....          |       |

| Station.                                       | Authority.                | Elevation.   |
|------------------------------------------------|---------------------------|--------------|
|                                                |                           | <i>Feet.</i> |
| Quincy.....                                    | C., C. C. & I. R. R.....  | 1,050        |
| Randall.....                                   | A. & G. W. R. R.....      | 1,046        |
| Ravenna.....                                   | Cin. & P. R. R.....       | 1,103        |
| Rawson.....                                    | L. E. & L. R. R.....      | 821          |
| Raysville.....                                 | M. & C. R. R.....         | 636          |
| Red Bank.....                                  | P. C. & St. L. R. R.....  | 501          |
| Reese's.....                                   | Scioto V. R. R.....       | 735          |
| Reeseville.....                                | C. & Z. R. R.....         | 1,086        |
| Republic.....                                  | B., P. & C. R. R.....     | 885          |
| Richland.....                                  | P., Ft. W. & C. R. R..... | 1,201        |
| Richmond.....                                  | P. C. & St. L. R. R.....  | 968          |
| Do.....                                        | L. S. & M. S. R. R.....   | 1,114        |
| Richwood.....                                  | N. Y., Pa. & O. R. R..... | 948          |
| Ridgefield.....                                | B., P. & C. R. R.....     | 779          |
| Ridgeway.....                                  | C., C. C. & I. R. R.....  | 1,059        |
| Rochester.....                                 | C., C. C. & I. R. R.....  | 935          |
| Rock Creek.....                                | Ash. & P. R. R.....       | 846          |
| Rockport.....                                  | L. S. & M. S. R. R.....   | 884          |
| Do...Geodetic Station.....                     | U. S. Lake Survey.....    | 781          |
| Rock Run.....                                  | P., C. & St. L. R. R..... | 758          |
| Robbins.....                                   | N. Y., Pa. & O. R. R..... | 982          |
| Rome.....                                      | Ash. & P. R. R.....       | 884          |
| Rootstown.....                                 | Cin. & P. R. R.....       | 1,123        |
| Roseville.....                                 | C. & Z. R. R.....         | 783          |
| Royalton, Geodetic Station.....                | U. S. Lake Survey.....    | 1,272        |
| Rush Run.....                                  | Cin. & P. R. R.....       | 679          |
| Rushsylvania.....                              | C., C. C. & I. R. R.....  | 1,236        |
| Russell.....                                   | C., T. V. & W. R. R.....  | 969          |
| Do... (C. T. V. & W. R. R crossing).....       | N. Y., Pa. & O. R. R..... | 973          |
| Russells.....                                  | P., C. & St. L. R. R..... | 501          |
| Russia.....                                    | C., C. C. & I. R. R.....  | 971          |
| Sabina.....                                    | C. & M. V. R. R.....      | 1,066        |
| St. Marys.....                                 | Miami Canal.....          | 864          |
| Salem.....                                     | M. & P. R. R.....         | 682          |
| Do.....                                        | P., Ft. W. & C. R. R..... | 1,173        |
| Salina.....                                    | C. & H. V. R. R.....      | 659          |
| Salineville.....                               | Cin. & P. R. R.....       | 879          |
| Salt Creek.....                                | D. & S. E. R. R.....      | 588          |
| Sandusky, City base.....                       | City Engineer.....        | 587          |
| Do...depot.....                                | L. S. & M. S. R. R.....   | 593          |
| Do...depot.....                                | S., D. & C. R. R.....     | 598          |
| Do...depot.....                                | B. & O. R. R.....         | 609          |
| Do...Geodetic Station.....                     | U. S. Lake Survey.....    | 632          |
| Do...Signal Station.....                       | U. S. Signal Office.....  | 639          |
| Sargents.....                                  | Scioto V. R. R.....       | 577          |
| Saville.....                                   | C., T. V. & W. R. R.....  | 986          |
| Saybrook.....                                  | L. S. & M. S. R. R.....   | 651          |
| Schooleys.....                                 | M. & C. R. R.....         | 666          |
| Sciotoville (junction with M. & C. R. R.)..... | Scioto V. R. R.....       | 546          |
| Selma.....                                     | P., C. & St. L. R. R..... | 1,083        |
| Seymours.....                                  | Ash. & P. R. R.....       | 797          |
| Shakerton.....                                 | C. N. R. R.....           | 745          |
| Sharon.....                                    | C., C., C. & I. R. R..... | 601          |
| Sharonville.....                               | Scioto V. R. R.....       | 597          |
| Shawville.....                                 | L. S. & M. S. R. R.....   | 744          |
| Shelby.....                                    | B. & O. R. R.....         | 1,088        |
| Do...Junction.....                             | B. & O. R. R.....         | 1,086        |
| Shiloh.....                                    | C., C., C. & I. R. R..... | 1,080        |
| Shoups.....                                    | P., C. & St. L. R. R..... | 831          |
| Sidney.....                                    | C., C., C. & I. R. R..... | 969          |
| Silver Creek.....                              | C., T. V. & W. R. R.....  | 948          |
| Do.....                                        | N. Y., Pa. & O. R. R..... | 1,392        |
| Do... (summit).....                            | D. & S. E. R. R.....      | 1,118        |
| Silverton.....                                 | C. N. R. R.....           | 825          |

| Station.                | Authority.                 | Elevation.   |
|-------------------------|----------------------------|--------------|
|                         |                            | <i>Feet.</i> |
| Wilmington .....        | C. & M. V. R. R. ....      | 1,017        |
| Winchester .....        | C. & H. V. R. R. ....      | 771          |
| Windham .....           | N. Y., Pa. & O. R. R. .... | 964          |
| Windsor .....           | N. Y., Pa. & O. R. R. .... | 1,067        |
| Winona .....            | C. & H. V. R. R. ....      | 743          |
| Woodburn .....          | P. C. & St. L. R. R. ....  | 533          |
| Woodland .....          | N. Y., Pa. & O. R. R. .... | 950          |
| Do. ....                | P., Ft. W. & C. R. R. .... | 1,245        |
| Woodsfield .....        | B. & S. W. R. R. ....      | 1,173        |
| Xenia .....             | P., C. & St. L. R. R. .... | 928          |
| Yellow Creek .....      | O. & E. Canal .....        | 758          |
| Yellow Springs .....    | P., C. & St. L. R. R. .... | 978          |
| York .....              | C., T. V. & W. R. R. ....  |              |
| Youngstown .....        | A. & G. W. R. R. ....      | 963          |
| Zaleski .....           | M. & Co. R. R. ....        | 721          |
| Zanesville .....        | C. & M. V. R. R. ....      | 742          |
| Zoar .....              | Cin. & P. R. R. ....       | 887          |
| Zoar Mills (lock) ..... | O. & E. Canal .....        | 893          |

| Station.                            | Authority.                     | Elevation.   |
|-------------------------------------|--------------------------------|--------------|
|                                     |                                | <i>Feet.</i> |
| .....                               | P., C. & St. L. R. R. ....     | 844          |
| .....                               | C., H. & D. R. R. ....         | 850          |
| anal .....                          | Miami Canal .....              | 830          |
| rossing Dayton & Mich. R. R. ....   | I., B. & W. R. R. ....         | 847          |
| as .....                            | C., T. V. & W. R. R. ....      | 827          |
| ille .....                          | P., C. & St. L. R. R. ....     | 863          |
| f .....                             | P., C. & St. L. R. R. ....     | 495          |
| ills Junction .....                 | B., P. & C. R. R. ....         | 759          |
| t .....                             | P., C. & St. L. R. R. ....     | 946          |
| n .....                             | V. R. R. ....                  | 1,073        |
| le .....                            | L. S. & M. S. R. R. ....       | 704          |
| C. S. & C. and P. C. O. & S. & L.   |                                |              |
| rossing .....                       | N. Y., Pa. & O. R. R. ....     | 1,030        |
| .....                               | C. N. R. R. ....               | 974          |
| unction .....                       | C., I., St. L. & C. R. R. .... | 499          |
| .....                               | P., Ft. W. & C. R. R. ....     | 784          |
| .....                               | L. S. & M. S. R. R. ....       | 585          |
| n .....                             | L. S. & M. S. R. R. ....       | 596          |
| .....                               | C., C., C. & I. R. R. ....     | 1,127        |
| .....                               | C., C., C. & I. R. R. ....     | 977          |
| .....                               | M. & C. R. R. ....             | 1,130        |
| unction .....                       | N. Y., Pa. & O. R. R. ....     | 869          |
| .....                               | M. & C. R. R. ....             | 774          |
| .....                               | Cin. & P. R. R. ....           | 495          |
| th .....                            | N. Y., Pa. & O. R. R. ....     | 1,349        |
| .....                               | L. S. & M. S. R. R. ....       | 862          |
| n Junction .....                    | B., P. & C. R. R. ....         | 719          |
| eta .....                           | C. H. & D. R. ....             | 876          |
| .....                               | Ash. & P. R. R. ....           | 875          |
| .....                               | M. & C. R. R. ....             | 671          |
| ille, Geodetic Station .....        | U. S. Lake Survey .....        | 1,214        |
| .....                               | C., T. V. & W. R. R. ....      | 958          |
| ton C. H. ....                      | C. & Z. R. R. ....             | 983          |
| .....                               | T. W. & W. R. R. ....          | 660          |
| tonville .....                      | N. Y., Pa. & O. R. R. ....     | 1,059        |
| .....                               | L. S. & M. S. R. R. ....       | 768          |
| Depot .....                         | Scioto V. R. R. ....           | 574          |
| .....                               | C. & Z. R. R. ....             | 764          |
| urgh .....                          | Cin. & P. R. R. ....           | 981          |
| .....                               | P., C. & St. L. R. R. ....     | 977          |
| .....                               | B. & S. W. R. R. ....          | 645          |
| .....                               | D. & S. E. R. R. ....          | 738          |
| e .....                             | Cin. & P. R. R. ....           | 688          |
| .....                               | Cin. & P. R. R. ....           | 845          |
| ster .....                          | C., C., C. & I. R. R. ....     | 745          |
| lle .....                           | C., Mt. V. & Del. R. R. ....   | 875          |
| erson .....                         | P., C., & St. L. R. R. ....    | 908          |
| ayette .....                        | P., C. & St. L. R. R. ....     | 803          |
| erty .....                          | S. D. & C. R. R. ....          | 1,099        |
| .....                               | C., H. & D. R. R. ....         | 666          |
| em .....                            | N. Y., Pa. & O. R. R. ....     | 1,095        |
| eeeling .....                       | C., T. V. & W. R. R. ....      | 648          |
| ..... low water in Ohio River ..... | C., T. V. & W. R. R. ....      | 618          |
| .....                               | Scioto V. R. R. ....           | 558          |
| .....                               | C. N. R. R. ....               | 875          |
| burgh .....                         | Scioto V. R. R. ....           | 540          |
| .....                               | M. P. R. R. ....               | 656          |
| nase .....                          | T., W. & W. R. R. ....         | 653          |
| lill .....                          | B., P. & C. R. R. ....         | 717          |
| .....                               | L. S. & M. S. R. R. ....       | 657          |
| port .....                          | C. & M. V. R. R. ....          | 783          |
| n .....                             | C., C., C. & I. R. R. ....     | 855          |
| by .....                            | L. S. & M. S. R. R. ....       | 635          |
| ... Geodetic Station .....          | U. S. Lake Survey .....        | 613          |

| Station.                | Authority.                 | Elevation.   |
|-------------------------|----------------------------|--------------|
|                         |                            | <i>Feet.</i> |
| Wilmington .....        | C. & M. V. R. R. ....      | 1,017        |
| Winchester .....        | C. & H. V. R. R. ....      | 771          |
| Windham .....           | N. Y., Pa. & O. R. R. .... | 964          |
| Windsor .....           | N. Y., Pa. & O. R. R. .... | 1,067        |
| Winona .....            | C. & H. V. R. R. ....      | 743          |
| Woodburn .....          | P. C. & St. L. R. R. ....  | 533          |
| Woodland .....          | N. Y., Pa. & O. R. R. .... | 950          |
| Do .....                | P., Ft. W. & C. R. R. .... | 1,245        |
| Woodsfield .....        | B. & S. W. R. R. ....      | 1,173        |
| Xenia .....             | P., C. & St. L. R. R. .... | 928          |
| Yellow Creek .....      | O. & E. Canal .....        | 758          |
| Yellow Springs .....    | P., C. & St. L. R. R. .... | 978          |
| York .....              | C., T. V. & W. R. R. ....  |              |
| Youngstown .....        | A. & G. W. R. R. ....      | 963          |
| Zaleski .....           | M. & Co. R. R. ....        | 721          |
| Zanesville .....        | C. & M. V. R. R. ....      | 742          |
| Zoar .....              | Cin. & P. R. R. ....       | 887          |
| Zoar Mills (lock) ..... | O. & E. Canal .....        | 893          |

# OREGON.

| Station.                           | Authority.                 | Elevation.   |
|------------------------------------|----------------------------|--------------|
|                                    |                            | <i>Feet.</i> |
| Albany.....                        | Oregon & Cal. R. R.....    | 238          |
| Albany Junction.....               | A. & L. R. R.....          | 249          |
| Albert Lake.....                   | Wheeler.....               | 4,209        |
| Alkali.....                        | N. P. R. R.....            | 232          |
| Amity.....                         | W. & O. & O. C. R. R.....  | 183          |
| Antelope P. O.....                 | Wheeler.....               | 2,845        |
| Astoria.....                       | Med. Dept. U. S. A.....    | 50           |
| Auburn.....                        | Smithsonian Inst.....      | 3,300        |
| Aurora.....                        | Oreg. & Cal. R. R.....     | 218          |
| Baker City.....                    | Oreg. R. R. & Nav. Co..... | 3,418        |
| Barnum's Ranch.....                | Wheeler.....               | 1,795        |
| Beaverton.....                     | W. & O. & O. C. R. R.....  | 212          |
| Big Meadows.....                   | Wheeler.....               | 4,124        |
| Big Spring.....                    | Wheeler.....               | 4,553        |
| Big Summit Prairie.....            | Wheeler.....               | 5,124        |
| Bonneville.....                    | N. P. R. R.....            | 80           |
| Box Elder Mountain.....            | Wheeler.....               | 9,541        |
| Brattons Ranch.....                | Wheeler.....               | 4,495        |
| Bridal Veil.....                   | N. P. R. R.....            | 46           |
| Burnt Ranch, John Day River.....   | Wheeler.....               | 1,561        |
| Button's Ranch.....                | Wheeler.....               | 4,237        |
| Camar.....                         | Powell.....                | 44           |
| Cameron, Fort.....                 | Wheeler.....               | 6,057        |
| Canby.....                         | Oreg. & Cal. R. R.....     | 175          |
| Canonville.....                    | Pacific R. R. Reports..... | 516          |
| Carlton.....                       | W. & O. & O. C. R. R.....  | 222          |
| Carmical's Ranch.....              | Wheeler.....               | 2,736        |
| Cascade Range, Timber line on..... |                            | 7,000        |
| Cedarville Pass.....               | Wheeler.....               | 6,356        |
| Cedarville Peak Valley.....        | Wheeler.....               | 8,308        |
| Cedarville, Surprise Valley.....   | Wheeler.....               | 4,675        |
| Celilo.....                        | Oreg. R. R. & Nav. Co..... | 142          |
| Do.....                            | N. P. R. R.....            | 160          |
| Chewaucan Marsh.....               | Wheeler.....               | 4,336        |
| Clackamas.....                     | Oreg. & Cal. R. R.....     | 134          |
| Clarnie.....                       | N. P. R. R.....            | 214          |
| Columbia City.....                 | N. P. R. R.....            | 90           |
| Cornelius.....                     | W. & O. & O. C. R. R.....  | 200          |
| Corral Springs.....                | Wheeler.....               | 4,569        |
| Corvallis.....                     | W. & O. & O. C. R. R.....  | 253          |
| Cottage Springs.....               | Wheeler.....               | 5,718        |
| Coyote.....                        | Powell.....                | 257          |
| Crater Lake.....                   | Wheeler.....               | 7,143        |
| Creswell.....                      | Oreg. & Cal. R. R.....     | 565          |
| Cross Hollows.....                 | Wheeler.....               | 3,197        |
| Current Creek, stage station.....  | Wheeler.....               | 2,142        |
| Curran's Ranch.....                |                            | 532          |
| Curry Spring.....                  | Wheeler.....               | 4,273        |
| Dallas.....                        | Wheeler.....               | 135          |
| Dalles, The.....                   | N. P. R. R.....            | 106          |
| Do.....                            | Oreg. R. R. & Nav. Co..... | 77           |
| Dayton Junction.....               | Oreg. R. R. & Nav. Co..... | 1,141        |
| Derry.....                         | W. & O. & O. C. R. R.....  | 214          |
| Deeschutte's Bridge.....           | Wheeler.....               | 166          |
| Deeschutte's River Bridge.....     | Wheeler.....               | 2,563        |
| Diamond Peak.....                  | Wheeler.....               | 8,807        |
| Dillard & Renshaw's Ranch.....     | Wheeler.....               | 4,657        |
| Dilley.....                        | W. & O. & O. C. R. R.....  | 217          |



| Station.                                      | Authority.                 | Elevation.   |
|-----------------------------------------------|----------------------------|--------------|
|                                               |                            | <i>Feet.</i> |
| Drains.....                                   | Oreg. & Cal. R. R.....     | 318          |
| Drew Valley Post-Office.....                  | Wheeler.....               | 4,953        |
| Duke.....                                     | U. S. C. & G. S.....       | 10           |
| Durand's Ranch (Silver Lake).....             | Wheeler.....               | 4,312        |
| East Portland.....                            | Oreg. & Cal. R. R.....     | 52           |
| Ebla.....                                     | Toner.....                 | 500          |
| Empire.....                                   | U. S. C. & G. S.....       | 49           |
| Eugene.....                                   | Oreg. & Cal. R. R.....     | 451          |
| Finnegan's Ranch, Military Road.....          | Wheeler.....               | 2,143        |
| Fish Lake.....                                | Wheeler.....               | 3,155        |
| Fletcher Ranch Valley.....                    | Wheeler.....               | 4,819        |
| Forest Grove.....                             | W. & O. & O. C. R. R.....  | 193          |
| Foster's Ranch, on Summer Lake.....           | Wheeler.....               | 4,174        |
| Froman.....                                   | A. & L. R. R.....          | 263          |
| Fry.....                                      | A. & L. R. R.....          | 287          |
| Gaston.....                                   | W. & O. & O. C. R. R.....  | 206          |
| Gervais.....                                  | Oreg. & Cal. R. R.....     | 210          |
| Goltra.....                                   | A. & L. R. R.....          | 306          |
| Granite Mountain.....                         | Wheeler.....               | 8,990        |
| Grant's.....                                  | Powell.....                | 180          |
| Grant's Landing.....                          | Wheeler.....               | 336          |
| Green's Ranch.....                            | Wheeler.....               | 4,470        |
| Hald's Ranch.....                             | Wheeler.....               | 3,267        |
| Halsey.....                                   | Oreg. & Cal. R. R.....     | 307          |
| Harney's Lake.....                            | Wallen.....                | 4,150        |
| Harrisburg.....                               | Oreg. & Cal. R. R.....     | 332          |
| Harris's Ranch.....                           |                            | 1,187        |
| Henderson.....                                | U. S. C. & G. S.....       | 39           |
| Hillsborough.....                             | W. & O. & O. C. R. R.....  | 196          |
| Hood River.....                               | Wheeler.....               | 280          |
| Hoskin's Ranch, Silver Creek.....             | Wheeler.....               | 4,139        |
| Hubbard.....                                  | Oreg. & Cal. R. R.....     | 206          |
| Independence.....                             | W. & O. & O. C. R. R.....  | 195          |
| Irvineville.....                              | A. & L. R. R.....          | 336          |
| Jefferson.....                                | Oreg. & Cal. R. R.....     | 264          |
| Jones Ranch, Honey Creek.....                 | Wheeler.....               | 4,466        |
| Junction.....                                 | Oreg. & Cal. R. R.....     | 345          |
| Kenny.....                                    | U. S. C. & G. S.....       | 100          |
| Klamath, Fort.....                            | Wheeler.....               | 4,108        |
| Do... Lake.....                               | Pacific R. R. Reports..... | 4,131        |
| Klamath Marsh.....                            | Wheeler.....               | 4,371        |
| Lake View.....                                | Wheeler.....               | 4,825        |
| Lane, Fort.....                               | Toner.....                 | 1,200        |
| Langden's Ranch.....                          | Wheeler.....               | 5,162        |
| Lapwai.....                                   | Toner.....                 | 1,000        |
| Latham.....                                   | Oreg. & Cal. R. R.....     | 657          |
| Laughlin's Pass.....                          | W. & O. & O. C. R. R.....  | 302          |
| Lebanon.....                                  | A. & L. R. R.....          | 371          |
| Little Meadows, on E. Fork of De Chute's..... | Wheeler.....               | 4,258        |
| Lodge Pole Spring.....                        | Wheeler.....               | 1,648        |
| Logan, Camp.....                              | Smithsonian Inst.....      | 5,600        |
| Lo-lo-che-wis Mountain.....                   | Wheeler.....               | 7,957        |
| Luera Ranch.....                              | Wheeler.....               | 2,443        |
| McCoy.....                                    | W. & O. & O. C. R. R.....  | 191          |
| McMinnville.....                              | W. & O. & O. C. R. R.....  | 178          |
| Marion.....                                   | Oreg. & Cal. R. R.....     | 322          |
| Martin.....                                   | U. S. C. & G. S.....       | 63           |
| Meacham Station.....                          | Oreg. R. R. & Nav. Co..... | 3,161        |
| Miller's Ranch (Summer Lake).....             | Wheeler.....               | 4,420        |
| Milwaukee.....                                | Oreg. & Cal. R. R.....     | 117          |
| Mosier.....                                   | N. P. R. R.....            | 100          |
| Moss's Ranch.....                             | Wheeler.....               | 4,928        |
| Mud Springs.....                              | Wheeler.....               | 2,443        |

| Station.                    | Authority.                   | Elevation.   |
|-----------------------------|------------------------------|--------------|
|                             |                              | <i>Feet.</i> |
| g.....                      | Wheeler.....                 | 4,739        |
| ount.....                   | Wheeler.....                 | 3,693        |
| ring.....                   | Wheeler.....                 | 2,914        |
| Mountain.....               | Wheeler.....                 | 8,471        |
| n-lake.....                 | Wheeler.....                 | 5,117        |
| ls.....                     | U. S. C. & G. S.....         | 5            |
| hill.....                   | W. & O. & O. C. R. R.....    | 204          |
| .....                       | Wheeler.....                 | 2,415        |
| Fort.....                   | Oreg. & Cal. R. R.....       | 450          |
| y.....                      | Toner.....                   | 810          |
| rt.....                     | Oreg. & Cal. R. R.....       | 99           |
| .....                       | Med. Dept., U. S. A.....     | 50           |
| .....                       | W. & O. & O. C. R. R.....    | 234          |
| nch.....                    | Wheeler.....                 | 3,330        |
| anch (Summer Lake).....     | Wheeler.....                 | 4,498        |
| ak.....                     | Wheeler.....                 | 7,387        |
| .....                       | Oreg. R. R. & Nav. Co.....   | 1,043        |
| .....                       | U. S. C. & G. S.....         | 24           |
| nt.....                     | U. S. C. & G. S.....         | 8            |
| t.....                      | Wheeler.....                 | 9,818        |
| .....                       | Smithsonian Institution..... | 150          |
| .....                       | W. & O. & O. C. R. R.....    | 53           |
| .....                       | N. P. R. R.....              | 43           |
| opposite).....              | Pacific R. R. Reports.....   | 66           |
| ourth street bridge.....    | .....                        | 190          |
| ignal Station.....          | U. S. Signal Office.....     | 67           |
| .....                       | Wheeler.....                 | 2,899        |
| .....                       | N. P. R. R.....              | 236          |
| .....                       | W. & O. & O. C. R. R.....    | 253          |
| .....                       | Oreg. & Cal. R. R.....       | 485          |
| Signal Station.....         | U. S. Signal Office.....     | 537          |
| co.....                     | .....                        | 4,671        |
| .....                       | W. & O. & O. C. R. R.....    | 158          |
| .....                       | Oreg. & Cal. R. R.....       | 187          |
| nt.....                     | Wheeler.....                 | 9,016        |
| ridge, Deschutes River..... | Wheeler.....                 | 702          |
| sh.....                     | Wheeler.....                 | 4,960        |
| use.....                    | .....                        | 1,151        |
| .....                       | U. S. C. & G. S.....         | 37           |
| .....                       | N. P. R. R.....              | 48           |
| Lake.....                   | Wallen.....                  | 4,196        |
| f Mountain.....             | Wheeler.....                 | 8,415        |
| ss.....                     | Pacific R. R. Reports.....   | 5,595        |
| .....                       | Oreg. & Cal. R. R.....       | 269          |
| ount.....                   | Wheeler.....                 | 7,519        |
| .....                       | N. P. R. R.....              | 60           |
| .....                       | Oreg. & Cal. R. R.....       | 310          |
| y.....                      | Wheeler.....                 | 1,089        |
| .....                       | Oreg. R. R. & Nav. R. R..... | 277          |
| unction.....                | N. P. R. R.....              | 302          |
| ignal Station.....          | U. S. Signal Office.....     | 384          |
| ort.....                    | Med. Dept., U. S. A.....     | 8            |
| .....                       | Oreg. R. R. & Nav. Co.....   | 2,793        |
| k.....                      | Wheeler.....                 | 7,298        |
| cades.....                  | Wheeler.....                 | 127          |
| math.....                   | .....                        | 4,131        |
| (opposite).....             | Pacific R. R. Reports.....   | 105          |
| .....                       | N. P. R. R.....              | 104          |
| .....                       | Smithsonian Institution..... | 190          |
| ng Agency.....              | Wheeler.....                 | 1,574        |
| ng Indian Agency.....       | Wheeler.....                 | 1,513        |
| ngs.....                    | Wheeler.....                 | 1,529        |
| amp.....                    | Wheeler.....                 | 5,730        |

| Station.              | Authority.                   | Elevation.            |
|-----------------------|------------------------------|-----------------------|
| Warner Lake Flat..... | Wheeler.....                 | <i>Feet.</i><br>4,544 |
| Watumpi Lake.....     |                              | 4,287                 |
| Wells .....           | W. & O. & P. O. C. R. R..... | 247                   |
| Willows .....         | N. P. R. R.....              | 234                   |
| Woodland .....        | U. S. C. & G. S.....         | 107                   |

(368)

# PENNSYLVANIA.

| Station.                                    | Authority.                  | Elevation.   |
|---------------------------------------------|-----------------------------|--------------|
|                                             |                             | <i>Feet.</i> |
| Abingdon Junction.....                      | N. Pa. R. R.....            | 254          |
| Do.....                                     | N. E. Pa. R. R.....         | 295          |
| Abington.....                               | Del. L. & W. R. R.....      | 1,058        |
| Ackley's.....                               | D., A. V. & P. R. R.....    | 1,236        |
| Adamsville.....                             | A. & G. W. R. R.....        | 1,148        |
| Aladdin Station.....                        | A. V. R. R.....             | 6,793        |
| Albs.....                                   | N. C. R. R.....             | 1,349        |
| Albion.....                                 | E. & P. R. R.....           | 857          |
| Alburtis.....                               | C. R. R.....                | 445          |
| Allegheny.....                              | Pa. R. R.....               | 1,152        |
| Allegheny City.....                         | P., Ft. W. & C. R. R.....   | 738          |
| Do..... Sycamore street                     | W. Pa. R. R.....            | 741          |
| Do..... East Lane.....                      |                             | 741          |
| Allentown, B. M. at.....                    | U. S. C. & G. S.....        | 321          |
| Allentown.....                              | L. & S. R. R.....           | 257          |
| Allenville.....                             | M. R. R.....                | 1,647        |
| Allenwood.....                              | C. & W. R. R.....           | 482          |
| Alligripus.....                             | Pa. R. R.....               | 1,920        |
| Alpsville.....                              | B. & O. R. R.....           | 768          |
| Alton.....                                  | N. Y., L. E. & W. R. R..... | 2,082        |
| Alton Summit.....                           | N. Y., L. E. & W. R. R..... | 2,140        |
| Altoona.....                                | Pa. R. R.....               | 1,179        |
| Do. W. line of ticket office.....           | Pa. R. R.....               | 1,178        |
| Do. front door of ticket office.....        | Pa. R. R.....               | 1,181        |
| Ambler.....                                 | N. Pa. R. R.....            | 199          |
| Anderson's.....                             | Pa. R. R.....               | 500          |
| Do..... water station.....                  | Pa. R. R.....               | 499          |
| Andover.....                                | L. S. & M. S. R. R.....     | 1,095        |
| Angora.....                                 | W. C. & P. R. R.....        | 745          |
| Annaville.....                              | Lebanon Valley R. R.....    | 442          |
| Apollo.....                                 | W. Pa. R. R.....            | 823          |
| Apple's brick house.....                    | S. & N. R. R.....           | 558          |
| Aqueduct.....                               | Pa. R. R.....               | 377          |
| Ararat Summit.....                          | N. Y., L. E. & W. R. R..... | 2,023        |
| Archbald.....                               | L. R. R.....                | 968          |
| Ardmore.....                                | Pa. R. R.....               | 359          |
| Argyle.....                                 | P. & K. C. R. R.....        | 1,161        |
| Armstrong's Coal Mines.....                 | B. & O. R. R.....           | 779          |
| Armstrong Station.....                      | A. V. R. R.....             | 746          |
| Arnold's Station.....                       | A. V. R. R.....             | 793          |
| Arnot.....                                  | Tioga R. R.....             | 1,682        |
| Ashland.....                                | N. C. R. R.....             | 269          |
| Ashland Depot.....                          | M. & S. R. R.....           | 859          |
| Ashley.....                                 | L. & S. R. R.....           | 634          |
| Aastabula.....                              | N. C. & B. V. R. R.....     | 683          |
| Athens Bridge.....                          | Lehigh Valley R. R.....     | 779          |
| Athens Mills.....                           | P. & P. R. R.....           | 1,266        |
| Auburn.....                                 | Phil. & R. R. R.....        | 471          |
| Auburn Junction.....                        | S. & S. R. R.....           | 466          |
| Austintown.....                             | N. C. & B. V. R. R.....     | 815          |
| Avery.....                                  | M. R. R.....                | 979          |
| Avon.....                                   | Lebanon Valley R. R.....    | 487          |
| Avondale.....                               | P. & B. C. R. R.....        | 227          |
| Do..... crossing P. & B. C. R. R.....       | Pa. & Del. R. R.....        | 2,821        |
| Do..... opposite center of coal office..... | Del., L. & W. R. R.....     | 530          |
| Babcock.....                                | N. Y., L. E. & W. R. R..... | 1,427        |
| Baden.....                                  | P., Ft. W. & C. R. R.....   | 710          |
| Bailey's Run.....                           | W. Pa. R. R.....            | 753          |

| Station.                                                   | Authority.                        | Elevation.   |
|------------------------------------------------------------|-----------------------------------|--------------|
|                                                            |                                   | <i>Feet.</i> |
| Baily's .....                                              | Pa. R. R. ....                    | 397          |
| Bainbridge .....                                           | Pa. R. R. ....                    | 271          |
| Bair's .....                                               | Pa. R. R. ....                    | 452          |
| Baker's .....                                              | S. & M. P. R. R. ....             | 1,890        |
| Bald Eagle Railroad Junction .....                         | B. & S. S. R. R. ....             | 722          |
| Do .....                                                   | T. & C. R. R. ....                | 989          |
| Baldwin's .....                                            | Chester Valley R. R. ....         | 290          |
| Banning's .....                                            | B. & O. R. R. ....                | 804          |
| Barnestown .....                                           | E. B. & W. R. R. ....             | 486          |
| Barnesville .....                                          | C. & W. R. R. ....                | 1,064        |
| Barnet Mine .....                                          | H. & B. T. R. R. ....             | 1,398        |
| Barre Forge .....                                          | Pa. R. R. ....                    | 724          |
| Barton .....                                               | S. C. & R. R. ....                | 804          |
| Bath .....                                                 | L. & L. R. R. ....                | 423          |
| Baumgardner's Station .....                                | L. & Q. R. R. ....                | 384          |
| Baxter's .....                                             | Bennett's Br. R. R. ....          | 1,206        |
| Beach Haven .....                                          | Del., L. & W. R. R. ....          | 530          |
| Beaghley's .....                                           | Berlin R. R. ....                 | 2,010        |
| Bear Lake .....                                            | A. & G. W. R. R. ....             | 1,550        |
| Beatty's Station .....                                     | Pa. R. R. ....                    | 1,073        |
| Beaver .....                                               | Cleve. & P. R. R. ....            | 711          |
| Beaver, at Ohio River .....                                | Levels .....                      | 666          |
| Beaver Co. Collieries, New Castle .....                    | N. C. & B. V. R. R. ....          | 793          |
| Do .....                                                   | Brier Hill, Mahoning Valley ..... |              |
| Do .....                                                   | Hattenburgh, Lower Vein .....     | 929          |
| Do .....                                                   | Sandy Lake .....                  | 1,083        |
| Do .....                                                   | Sandy Lake, Lower Vein .....      | 1,313        |
| Beaver Dam .....                                           | W. & R. R. R. ....                | 1,113        |
| Beaver Falls .....                                         | P., Ft. W. & C. R. R. ....        | 603          |
| Beaver Valley water-tank .....                             | C. & W. R. R. ....                | 771          |
| Bechtelsville .....                                        | C. R. R. ....                     | 924          |
| Bedford .....                                              | Bed. & Bridge. R. R. ....         | 401          |
| Beechwood .....                                            | P. & E. R. R. ....                | 1,068        |
| Beersville .....                                           | E. Broadtop R. R. ....            | 1,244        |
| Bellefonte .....                                           | Bellefonte Branch R. R. ....      | 658          |
| Belle Valley .....                                         | P. & E. R. R. ....                | 744          |
| Bellevue .....                                             | P., Ft. W. & C. R. R. ....        | 1,007        |
| Bell's Mills .....                                         | Bennett's Br. R. R. ....          | 728          |
| Bell's Mills Junction .....                                | B. G. R. R. ....                  | 1,268        |
| Belmont .....                                              | Phil. & R. R. R. ....             | 1,080        |
| Benezette .....                                            | Beunett's Br. R. R. ....          | 49           |
| Bennett .....                                              | W. Pa. R. R. ....                 | 1,040        |
| Bennett Station .....                                      | Del., L. & W. R. R. ....          | 741          |
| Bennington Furnace .....                                   | Pa. R. R. ....                    | 553          |
| Berlin .....                                               | Berlin R. R. ....                 | 2,038        |
| Bernice .....                                              | S. L. & S. R. R. ....             | 2,176        |
| Berwick .....                                              | Del., L. & W. R. R. ....          | 1,858        |
| Bethany .....                                              | S. W. Pa. R. R. ....              | 505          |
| Bethayer's Station, $\frac{1}{4}$ mile from junction ..... | N. Pa. R. R. ....                 | 1,051        |
| Bethlehem .....                                            | Lehigh Valley R. R. ....          | 144          |
| Bethlehem Junction .....                                   | L. & L. R. R. ....                | 235          |
| Biehl .....                                                | L. C. & S. C. R. R. ....          | 240          |
| Bigler .....                                               | T. & C. R. R. ....                | 518          |
| Big Shanty .....                                           | N. Y., L. E. & W. R. R. ....      | 1,062        |
| Bird-in-Hand .....                                         | Pa. R. R. ....                    | 1,730        |
| Birdsborough .....                                         | Phila. & R. R. R. ....            | 359          |
| Birmingham .....                                           | Pa. R. R. ....                    | 173          |
| Do .....                                                   | P., C. & St. L. R. R. ....        | 866          |
| Do .....                                                   | B. & O. R. R. ....                | 768          |
| Do .....                                                   | P. V. & C. R. R. ....             | 751          |
| Do .....                                                   | P. V. & C. R. R. ....             | 802          |
| Do .....                                                   | P. V. & C. R. R. ....             | 795          |

| Station.                                                                  | Authority.                   | Elevation.   |
|---------------------------------------------------------------------------|------------------------------|--------------|
|                                                                           |                              | <i>Feet.</i> |
| ingham, 22d street .....                                                  | P. V. & C. R. R. ....        | 780          |
| ..... 30th street .....                                                   | P. V. & C. R. R. ....        | 761          |
| .....                                                                     | B. V. R. R. ....             | 2,044        |
| .....                                                                     | Pa. R. R. ....               | 482          |
| Lick .....                                                                | Pa. R. R. ....               | 963          |
| Log .....                                                                 | Pa. R. R. ....               | 482          |
| Log Mountain .....                                                        | Levels .....                 | 1,616        |
| s Station .....                                                           | A. V. R. R. ....             | 922          |
| Walnut .....                                                              | Lehigh Valley R. R. ....     | 649          |
| Furnace .....                                                             | Pa. R. R. ....               | 1,114        |
| ville Junction, intersection of B. &<br>of Pa. R. R. with main line ..... | Pa. R. R. ....               | 1,113        |
| ville, Market-street Station .....                                        | Pa. R. R. ....               | 1,011        |
| n .....                                                                   | E. Pa. R. R. ....            | 418          |
| Run Summit .....                                                          | H. & B. T. R. R. ....        | 1,234        |
| field, Iron Mines and Furnace .....                                       | Pa. R. R. ....               | 1,460        |
| burgh .....                                                               | Del., L. & W. R. R. ....     | 489          |
| urgh .....                                                                | Tioga R. R. ....             | 1,348        |
| all .....                                                                 | T. & C. R. R. ....           | 1,547        |
| r .....                                                                   | Pa. R. R. ....               | 1,033        |
| fon .....                                                                 | P., W. & B. R. R. ....       | 60           |
| .....                                                                     | Phil. & T. R. R. ....        | 35           |
| ia Junction .....                                                         | Bennett's Br. R. R. ....     | 1,074        |
| .....                                                                     | E. Pa. R. R. ....            | 454          |
| nsville .....                                                             | L. & S. R. R. ....           | 436          |
| .....                                                                     | Chartiers R. R. ....         | 865          |
| 'arm .....                                                                | P., T. & B. R. R. ....       | 1,086        |
| own .....                                                                 | C. R. R. ....                | 339          |
| ck's .....                                                                | B. & O. R. R. ....           | 769          |
| ck's Station .....                                                        | Pa. R. R. ....               | 828          |
| rd .....                                                                  | N. Y., L. E. & W. R. R. .... | 1,464        |
| ys .....                                                                  | E. & C. R. R. ....           | 2,118        |
| s Bend Station .....                                                      | A. V. R. R. ....             | 856          |
| r's Summit .....                                                          | H. & B. T. R. R. ....        | 1,108        |
| .....                                                                     | L. S. & M. S. R. R. ....     | 1,200        |
| n's Station .....                                                         | A. V. R. R. ....             | 961          |
| nville .....                                                              | C. & W. R. R. ....           | 1,285        |
| s .....                                                                   | N. Y., L. E. & W. R. R. .... | 1,047        |
| 'wine .....                                                               | W. & R. R. R. ....           | 556          |
| 'wine Summit .....                                                        | P. & B. C. R. R. ....        | 273          |
| Creek .....                                                               | Del., L. & W. R. R. ....     | 502          |
| port, Bedford County .....                                                | Bed. & Bridge R. R. ....     | 930          |
| ..... Bedford County .....                                                | B. & O. R. R. ....           | 941          |
| ..... Montgomery County .....                                             | Phil. & R. R. R. ....        | 76           |
| ..... Cumberland County .....                                             | N. C. R. R. ....             | 365          |
| ..... Cumberland County, north end<br>Susquehanna Bridge .....            | Cumberland Valley R. R. .... | 357          |
| ..... Clearfield County .....                                             | T. & C. R. R. ....           | 1,190        |
| ton, bench-mark .....                                                     | P. B. R. R. ....             | 306          |
| ville .....                                                               | Chartiers R. R. ....         | 822          |
| st Station .....                                                          | A. V. R. R. ....             | 747          |
| r's Station .....                                                         | Pa. R. R. ....               | 757          |
| , middle of Market street .....                                           | Phil. & T. R. R. ....        | 21           |
| ford .....                                                                | P. & C. R. R. ....           | 873          |
| op City .....                                                             | Levels .....                 | 1,963        |
| ille .....                                                                | Schnylkill Valley R. R. .... | 778          |
| rayville .....                                                            | N. Y., R. & P. R. R. ....    | 1,448        |
| ad .....                                                                  | L. & L. R. R. ....           | 313          |
| ville, bench-mark .....                                                   | P. B. R. R. ....             | 478          |
| yn .....                                                                  | E. B. & W. R. R. ....        | 331          |
| ide, at crossing of creek .....                                           | Mt. A. R. R. ....            | 707          |
| unnel .....                                                               | B. & O. R. R. ....           | 1,558        |
| ille Station .....                                                        | Bennett's Br. R. R. ....     | 1,235        |
| .....                                                                     | B. & O. R. R. ....           | 757          |

| Station.                                                                                                | Authority.                  | Elevation.   |
|---------------------------------------------------------------------------------------------------------|-----------------------------|--------------|
|                                                                                                         |                             | <i>Feet.</i> |
| Brownsville at Monongahela River.....                                                                   | Cumberland Turnpike.....    | 873          |
| Bruce, bench-mark.....                                                                                  | P. B. R. R.....             | 331          |
| Bruckhart's.....                                                                                        | R. & C. R. R.....           | 425          |
| Brush Run.....                                                                                          | Pa. R. R.....               | 933          |
| Brushton Station.....                                                                                   | Pa. R. R.....               | 922          |
| Bryansville.....                                                                                        | P. B. R. R.....             | 941          |
| Bryn Mawr.....                                                                                          | Pa. R. R.....               | 416          |
| Buchanan's.....                                                                                         | E. B. & W. R. R.....        | 672          |
| Buchannon.....                                                                                          | L. C. & S. C. R. R.....     | 1,059        |
| Buck Mountain.....                                                                                      | L. & S. R. R.....           | 1,620        |
| Buffalo Station.....                                                                                    | W. Pa. R. R.....            | 768          |
| Bulger.....                                                                                             | P. C. & St. L. R. R.....    | 1,156        |
| Bunker Hill.....                                                                                        | L. & T. R. R.....           | 437          |
| Do.....                                                                                                 | N. Pa. R. R.....            | 523          |
| Bunkertown.....                                                                                         | S. & N. R. R.....           | 706          |
| Burgettstown.....                                                                                       | P. C. & St. L. R. R.....    | 1,011        |
| Burkholder.....                                                                                         | Berlin R. R.....            | 1,992        |
| Burning Well Station, cor. of coping, lower<br>end, N. arch culvert, above Burning Well<br>Station..... | A. V. R. R.....             | 945          |
| Bushore.....                                                                                            | S., L. & S. R. R.....       | 1,593        |
| Butler.....                                                                                             | W. Pa. R. R.....            | 1,008        |
| Butler Junction.....                                                                                    | W. Pa. R. R.....            | 769          |
| Buttsville.....                                                                                         | N. Y., R. & P. R. R.....    | 1,996        |
| Cabeau's Station.....                                                                                   | L. & Q. R. R.....           | 389          |
| Caledonia Tunnel, E. end.....                                                                           | Bennett's Br. R. R.....     | 1,148        |
| Caln.....                                                                                               | Pa. R. R.....               | 359          |
| Cambria.....                                                                                            | Pickering Valley R. R.....  | 322          |
| Cambridge.....                                                                                          | A. & G. W. R. R.....        | 1,163        |
| Do.....                                                                                                 | P. & P. R. R.....           | 1,158        |
| Camden.....                                                                                             | P. V. & C. R. R.....        | 754          |
| Cameron.....                                                                                            | P. & E. R. R.....           | 964          |
| Do.....                                                                                                 | Del., L. & W. R. R.....     | 458          |
| Campbelltown.....                                                                                       | J. S., P. C. & B. R. R..... | 700          |
| Camp Ground Station.....                                                                                | A. V. R. R.....             | 789          |
| Camp Hill.....                                                                                          | N. Pa. R. R.....            | 178          |
| Camp Hummel.....                                                                                        | T. & C. R. R.....           | 1,622        |
| Cannan.....                                                                                             | Pa. R. R.....               | 1,066        |
| Cannansburg.....                                                                                        | Chartiers R. R.....         | 936          |
| Cantner.....                                                                                            | S. & M. P. R. R.....        | 2,108        |
| Canton.....                                                                                             | N. C. R. R.....             | 1,961        |
| Carbondale.....                                                                                         | N. Y., L. E. & W. R. R..... | 1,079        |
| Do..... Coal Brooke Breaker.....                                                                        | L. R. R.....                | 1,066        |
| Do..... Canal level.....                                                                                |                             | 965          |
| Carlisle.....                                                                                           | Cumberland Valley R. R..... | 477          |
| Do B. M. on base of column west side<br>of jail entrance.....                                           | U. S. C. & G. S.....        | 473          |
| Carlton.....                                                                                            | A. & G. W. R. R.....        | 1,047        |
| Carpenter's.....                                                                                        | N. C. R. R.....             | 1,901        |
| Carpenter's Station.....                                                                                | Pa. R. R.....               | 854          |
| Castleman.....                                                                                          | B. & O. R. R.....           | 1,757        |
| Catawauqua.....                                                                                         | Lehigh Valley R. R.....     | 929          |
| Catawissa.....                                                                                          | C. & W. R. R.....           | 477          |
| Do.....                                                                                                 | D., H. & W. R. R.....       | 470          |
| Catfish.....                                                                                            | Pa. R. R.....               | 968          |
| Catfish Station, door sill telegraph office,<br>south side.....                                         | A. V. R. R.....             | 859          |
| Cedar Hollow.....                                                                                       | Chester Valley R. R.....    | 246          |
| Central Point.....                                                                                      | P. & K. C. R. R.....        | 1,184        |
| Centre Hall.....                                                                                        | L. C. & S. C. R. R.....     | 1,272        |
| Centreville.....                                                                                        | Chester Valley R. R.....    | 202          |
| Do.....                                                                                                 | P. F. & B. R. R.....        | 1,297        |
| Chadd's Ford.....                                                                                       | P. & B. C. R. R.....        | 129          |
| Do.....                                                                                                 | W. & R. R. R.....           | 175          |

| Station.                            | Authority.              | Elevation.   |
|-------------------------------------|-------------------------|--------------|
|                                     |                         | <i>Feet.</i> |
| burg                                | Cumberland Valley R. R. | 618          |
| B. M. on base north pillar          |                         |              |
| front court-house                   | U. S. C. & G. S.        | 620          |
|                                     | C. & F. R. R.           | 541          |
| ville                               | L. & L. R. R.           | 576          |
| Station                             | A. V. R. R.             | 765          |
|                                     | W. C. & P. R. R.        | 240          |
| ights                               | P. & B. C. R. R.        | 234          |
| rings                               | Pickering Valley R. R.  | 273          |
| hill                                | Phil. & R. R. R.        | 410          |
|                                     | B., C. & P. R. R.       | 1,474        |
|                                     | Pa. R. R.               | 255          |
| dge                                 | Pa. R. R.               | 351          |
|                                     | Pa. R. R.               | 491          |
|                                     | Del., L. & W. R. R.     | 455          |
| e                                   | Phil. & N. R. R.        | 184          |
|                                     | B. & O. R. R.           | 761          |
|                                     | P. & E. R. R.           | 1,396        |
| mmitt                               | P. & E. R. R.           | 2,024        |
|                                     | L. S. & M. S. R. R.     | 1,164        |
| ry                                  | N. C. R. R.             | 366          |
|                                     | E. & P. R. R.           | 894          |
|                                     | B. & O. R. R.           | 1,143        |
|                                     | T. & C. R. R.           | 1,103        |
| reek                                | T. & C. R. R.           | 1,140        |
| Bishop's Summit                     | McK. & B. R. R.         | 2,074        |
|                                     | W. C. & P. R. R.        | 109          |
|                                     | N. C. & B. V. R. R.     | 900          |
|                                     | L. & L. R. R.           | 362          |
| h                                   | L. S. & M. S. R. R.     | 1,199        |
| Crossing                            | N. C. & F. R. R.        | 1,194        |
|                                     | H. & B. T. R. R.        | 1,126        |
|                                     | H. & B. T. R. R.        | 1,110        |
|                                     | L. & S. R. R.           | 585          |
|                                     | W. & R. R. R.           | 315          |
| intersection of W. & R. R. R.       | Pa. R. R.               | 380          |
|                                     | P. T. & B. R. R.        | 1,134        |
|                                     | L. C. & S. C. R. R.     | 1,026        |
|                                     | A. & G. W. R. R.        | 1,064        |
|                                     | H. & B. T. R. R.        | 872          |
|                                     | N. Pa. R. R.            | 34           |
|                                     | W. & R. R. R.           | 525          |
| g.                                  | S. & S. R. R.           | 874          |
| ale.                                | C. R. R.                | 316          |
|                                     | L. & S. R. R.           | 962          |
|                                     | McK. & B. R. R.         | 1,543        |
| ation                               | A. V. R. R.             | 746          |
| ion                                 | E. Broadtop R. R.       | 1,359        |
| e                                   | Perkiomen R. R.         | 155          |
|                                     | B. G. R. R.             | 1,642        |
|                                     | Pa. R. R.               | 285          |
|                                     | P. T. & B. R. R.        | 1,067        |
| ross Roads.                         | N. C. R. R.             | 1,148        |
|                                     | Pa. R. R.               | 251          |
| unction Col. Br. of Pa. R. R.       | York Br. Pa., R. R.     | 251          |
| fill St                             | R. & C. R. R.           | 264          |
| ol. Depot                           | R. & C. R. R.           | 250          |
| Pa. R. R. Depot                     | C. & P. D. R. R.        | 251          |
| Pa. R. R. track in front of passen- |                         |              |
| ger station                         | C. & P. D. R. R.        | 241          |
|                                     | A. & G. W. R. R.        | 1,427        |
|                                     | P. & E. R. R.           | 1,401        |
|                                     | P. & B. C. R. R.        | 237          |
|                                     | A. & G. W. R. R.        | 1,361        |



| Station.                                     | Authority.                  | Elevation.   |
|----------------------------------------------|-----------------------------|--------------|
|                                              |                             | <i>Feet.</i> |
| Concord.....                                 | P. & E. R. R.....           | 1,384        |
| Conemaugh.....                               | Pa. R. R.....               | 1,225        |
| Do..... Furnace.....                         | Pa. R. R.....               | 1,135        |
| Conestoga.....                               | W. & R. R. R.....           | 647          |
| Conewago.....                                | Pa. R. R.....               | 429          |
| Do..... Bridge.....                          | Pa. R. R.....               | 546          |
| Confluence.....                              | B. & O. R. R.....           | 1,346        |
| Connantsville.....                           | E. & P. R. R.....           | 1,066        |
| Connant Pool.....                            | Levels.....                 | 1,082        |
| Connellsville.....                           | P. & C. R. R.....           | 894          |
| Do.....                                      | S. W. Pa. R. R.....         | 915          |
| Do..... S. W. Pa. R. R.....                  | B. & O. R. R.....           | 894          |
| Conahocken.....                              | Phil. & R. R. R.....        | 59           |
| Cook's.....                                  | Chartier's R. R.....        | 1,003        |
| Cook's Mills.....                            | B. & O. R. R.....           | 774          |
| Cook's Run.....                              | P. & E. R. R.....           | 709          |
| Cook's Station.....                          | E. Broadtop R. R.....       | 1,541        |
| Cools.....                                   | M. R. R.....                | 1,547        |
| Cool Spring.....                             | S. & A. R. R.....           | 1,127        |
| Coopersburg.....                             | N. Pa. R. R.....            | 549          |
| Copeland Station.....                        | Pa. R. R.....               | 853          |
| Coplay.....                                  | Lehigh Valley R. R.....     | 296          |
| Copper Works.....                            | B. & O. R. R.....           | 763          |
| Cornog's.....                                | E., B. & W. R. R.....       | 361          |
| Cornwall.....                                | L. & C. R. R.....           | 603          |
| Cornwall's.....                              | Phil. & T. R. R.....        | 39           |
| Corry.....                                   | P. & E. R. R.....           | 1,431        |
| Do..... grade crossing P. & E. R. R.....     | A. & G. W. R. R.....        | 1,498        |
| Corry Junction.....                          | B., C. & P. R. R.....       | 1,423        |
| Do..... junction with P. & E. R. R.....      | P., T. & B. R. R.....       | 1,433        |
| Do..... junction with B., C. & P. R. R.....  | P., T. & B. R. R.....       | 1,445        |
| Do..... crossing first avenue.....           | P., T. & B. R. R.....       | 1,430        |
| Do..... crossing Centre street.....          | P., T. & B. R. R.....       | 1,434        |
| Do..... crossing P., E. & A. G. W. R. R..... | P., T. & B. R. R.....       | 1,431        |
| Do..... Station.....                         | A. & G. W. R. R.....        | 1,431        |
| Do..... grade crossing B., C. & P. R. R..... | A. & G. W. R. R.....        | 1,443        |
| Coudersport.....                             | J. S., P. C. & B. R. R..... | 1,661        |
| Coulson.....                                 | N. C. & F. R. R.....        | 1,277        |
| Coultersville.....                           | B. & O. R. R.....           | 768          |
| Cove.....                                    | H. & B. T. R. R.....        | 921          |
| Covert's Mills.....                          | N. C. & B. V. R. R.....     | 790          |
| Covington.....                               | Tioga R. R.....             | 1,308        |
| Cowanahannock Station.....                   | A. V. R. R.....             | 809          |
| Crafton.....                                 | P. C. & St. L. R. R.....    | 679          |
| Crawford.....                                | H. & B. T. R. R.....        | 1,242        |
| Do.....                                      | N. Y., L. E. & W. R. R..... | 2,098        |
| Crawford's.....                              | A. & G. W. R. R.....        | 893          |
| Crescentville.....                           | Phil. & N. R. R.....        | 95           |
| Creason.....                                 | Pa. R. R.....               | 2,017        |
| Do..... R. R. Junction.....                  | E. & C. R. R.....           | 2,098        |
| Do..... switch to E. & C. R. R.....          | Pa. R. R.....               | 2,098        |
| Crosby.....                                  | McK. & B. R. R.....         | 1,540        |
| Crosses.....                                 | E. & P. R. R.....           | 765          |
| Cross Road.....                              | S. B. R. R.....             | 668          |
| Cumbola.....                                 | Schuylkill Valley R. R..... | 668          |
| Cupola.....                                  | E. B. & W. R. R.....        | 565          |
| Curwensville.....                            | T. & C. R. R.....           | 1,141        |
| Daguschahonda.....                           | P. & E. R. R.....           | 1,480        |
| Dahaga.....                                  | P. & E. R. R.....           | 1,605        |
| Dallastown.....                              | P. B. R. R.....             | 657          |
| Dam.....                                     | E. & C. R. R.....           | 1,980        |
| Dampman's.....                               | E. B. & W. R. R.....        | 698          |
| Danville.....                                | C. & W. R. R.....           | 494          |
| Do.....                                      | D., H. & W. R. R.....       | 463          |

| Station.                           | Authority.              | Elevation.   |
|------------------------------------|-------------------------|--------------|
|                                    |                         | <i>Feet.</i> |
| N. E. end depot, top of near rail. | Del., L. & W. R. R.     | 457          |
| ad .....                           | P., W. & B. R. R.       | 45           |
| 1 .....                            | W. C. & P. R. R.        | 103          |
| .....                              | P., Ft. W. & C. R. R.   | 981          |
| .....                              | W. C. & P. R. R.        | 143          |
| East end R. R. bridge .....        | N. C. R. R.             | 349          |
| center of passenger station .....  | N. C. R. R.             | 349          |
| .....                              | S. W. Pa. R. R.         | 898          |
| .....                              | P., T. & B. R. R.       | 1,076        |
| L. R. Br. R. R. ....               | B. & O. R. R.           | 864          |
| .....                              | N. Y., L. E. & W. R. R. | 1,523        |
| station .....                      | W. Pa. R. R.            | 1,224        |
| Water Gap .....                    | Del., L. & W. R. R.     | 319          |
| .....                              | P. B. R. R.             | 435          |
| n Station .....                    | Bennett's Br. R. R.     | 926          |
| .....                              | Pa. R. R.               | 1,172        |
| .....                              | P. & E. R. R.           | 485          |
| tion .....                         | W. Pa. R. R.            | 1,307        |
| Junction, Col. Branch .....        | Pa. R. R.               | 359          |
| .....                              | M. & D. R. R.           | 542          |
| Junction .....                     | Cumberland Valley R. R. | 427          |
| .....                              | M. R. R.                | 1,507        |
| .....                              | P., C. & St. L. R. R.   | 1,059        |
| .....                              | P., Ft. W. & C. R. R.   | 723          |
| .....                              | Pa. & Del. R. R.        | 374          |
| .....                              | L. & T. R. R.           | 910          |
| .....                              | E. B. & W. R. R.        | 280          |
| .....                              | M. C. R. R.             | 647          |
| tation .....                       | A. V. R. R.             | 915          |
| ille .....                         | Phil. & R. R. R.        | 161          |
| orge .....                         | E. B. & W. R. R.        | 274          |
| on .....                           | Pa. R. R.               | 266          |
| ...terminus junction with N.       |                         |              |
| k of Pa. R. R. ....                | E. B. & W. R. R.        | 266          |
| n .....                            | N. Pa. R. R.            | 347          |
| le .....                           | L. Schuyl. R. R.        | 494          |
| .....                              | L. & S. R. R.           | 1,633        |
| .....                              | P. & E. R. R.           | 816          |
| junction with P. & E. R. R. ....   | Bennett's Br. R. R.     | 813          |
| .....                              | P. & C. R. R.           | 1,011        |
| .....                              | T. & C. R. R.           | 1,453        |
| .....                              | L. C. & S. C. R. R.     | 1,078        |
| n .....                            | Pa. R. R.               | 356          |
| ille .....                         | Pa. R. R.               | 990          |
| .....                              | Del., L. & W. R. R.     | 1,400        |
| dy .....                           | P., T. & B. R. R.       | 1,156        |
| Borough .....                      | W. P. R. R.             | 741          |
| .....                              | E. & C. R. R.           | 1,927        |
| .....                              | Schuylkill Valley R. R. | 661          |
| k .....                            | P., T. & B. R. R.       | 1,046        |
| .....                              | B. E. Valley R. R.      | 635          |
| .....                              | N. C. & F. R. R.        | 906          |
| .....                              | Phil. & R. R. R.        | 119          |
| nburgh .....                       | S. W. Pa. R. R.         | 1,062        |
| erty Station .....                 | Pa. R. R.               | 918          |
| snoy Junction .....                | E. M. R. R.             | 1,109        |
| .....                              | Lehigh Valley R. R.     | 210          |
| .....                              | L. & S. R. R.           | 215          |
| M. on W. corner jail, .....        | U. S. C. & G. S.        | 357          |
| indow sill E. side C. H. ....      | U. S. C. & G. S.        | 364          |
| M. at .....                        | U. S. C. & G. S.        | 214          |
| t. R. Junction .....               | Lehigh Valley R. R.     | 251          |
| y Station .....                    | A. V. R. R.             | 975          |
| ville .....                        | D., A. V. & P. R. R.    | 1,178        |

| Station.                                      | Authority.                   | Elevation.   |
|-----------------------------------------------|------------------------------|--------------|
|                                               |                              | <i>Feet.</i> |
| Ebensburgh.....                               | E. & C. R. R.....            | 2,082        |
| Eckley.....                                   | L. & S. R. R.....            | 1,663        |
| Economy.....                                  | P., Ft. W. & C. R. R.....    | 715          |
| Eddington, Dunk's Ferry Road.....             | Phil. & T. R. R.....         | 42           |
| Edge Hill.....                                | N. Pa. R. R.....             | 293          |
| Edgewater Station.....                        | A. V. R. R.....              | 761          |
| Edgewood Station.....                         | Pa. R. R.....                | 923          |
| Edgeworth.....                                | P., Ft. W. W. & C. R. R..... | 725          |
| Edinborough.....                              | P. & P. R. R.....            | 1,212        |
| Do. Geodetic Station.....                     | U. S. Lake Survey.....       | 1,603        |
| Edinburgh.....                                | N. C. & B. V. R. R.....      | 802          |
| Egypt.....                                    | B. & O. R. R.....            | 1,302        |
| Eldorado.....                                 | Pa. R. R.....                | 1,093        |
| Eldred.....                                   | B., N. Y. & P. R. R.....     | 1,443        |
| Elizabeth.....                                | P. V. & C. R. R.....         | 747          |
| Elizabeth Furnace.....                        | Pa. R. R.....                | 1,079        |
| Elizabethtown.....                            | Pa. R. R.....                | 457          |
| Ellrod.....                                   | B. & O. R. R.....            | 788          |
| Ellwood.....                                  | S. & S. R. R.....            | 672          |
| Elm.....                                      | Pa. R. R.....                | 285          |
| Emaus Junction.....                           | Perkiomen R. R.....          | 391          |
| Emarres Station.....                          | E. Pa. R. R.....             | 434          |
| Embeenville.....                              | W. & R. R. R.....            | 221          |
| Emigsville.....                               | N. C. R. R.....              | 376          |
| Emlenton Station.....                         | A. V. R. R.....              | 905          |
| Emporium.....                                 | B., N. Y. & P. R. R.....     | 1,094        |
| Do.....                                       | P. & E. R. R.....            | 1,032        |
| Emaworth.....                                 | P., Ft. W. & C. R. R.....    | 725          |
| Enon.....                                     | P., Ft. W. & C. R. R.....    | 994          |
| Enterprise.....                               | P. B. R. R.....              | 531          |
| Do.....                                       | Pithole Valley R. R.....     | 1,261        |
| Enz.....                                      | Bennett's Br. R. R.....      | 964          |
| Eochwan Station.....                          | A. V. R. R.....              | 982          |
| Ephrata.....                                  | R. & C. R. R.....            | 394          |
| Erie, Depot.....                              | L. S. & M. S. R. R.....      | 686          |
| Do. Chestnut st., at 2d st. (Lake Bluff)..... | City Levels.....             | 643          |
| Do. Chesnut and 26th st.....                  | City Levels.....             | 763          |
| Do. Water in reservoir, city water works..... | City Levels.....             | 808          |
| Do. Centre of State st., at pier.....         | P. & E. R. R.....            | 523          |
| Do. Geodetic Station.....                     | U. S. Lake Survey.....       | 859          |
| Do. Signal Station.....                       | U. S. Signal Office.....     | 681          |
| Espy.....                                     | Del., L. & W. R. R.....      | 490.25       |
| Espyville.....                                | E. & P. R. R.....            | 1,068        |
| Evans.....                                    | P. & C. R. R.....            | 1,009        |
| Evansburgh.....                               | A. & G. W. R. R.....         | 1,264        |
| Everett.....                                  | H. & B. T. R. R.....         | 1,118        |
| Evergreen Water Station.....                  | Bennett's Br. R. R.....      | 1,398        |
| Everson.....                                  | S. W. Pa. R. R.....          | 1,034        |
| Ewing's Mills.....                            | Chartier's R. R.....         | 978          |
| Exeter.....                                   | Phil. & R. R. R.....         | 193          |
| Exton.....                                    | Chester Valley R. R.....     | 294          |
| Factoryville.....                             | Del., L. & W. R. R.....      | 920          |
| Fairbanks, junction of coal road.....         | W. Pa. R. R.....             | 923          |
| Fairhope.....                                 | B. & O. R. R.....            | 1,380        |
| Fairmount Station.....                        | Bennett's Br. R. R.....      | 1,086        |
| Fair Oaks.....                                | P., Ft. W. & C. R. R.....    | 715          |
| Fairview.....                                 | Lehigh Valley R. R.....      | 1,673        |
| Fairview.....                                 | E. & P. R. R.....            | 735          |
| Do.....                                       | W. Pa. R. R.....             | 741          |
| Do.....                                       | Pa. R. R.....                | 355          |
| Fairville.....                                | P. & B. C. R. R.....         | 255          |
| Fall Brook.....                               | Tioga R. R.....              | 1,848        |
| Falls.....                                    | Lehigh Valley R. R.....      | 587          |

| Station.                                                            | Authority.                   | Elevation.   |
|---------------------------------------------------------------------|------------------------------|--------------|
|                                                                     |                              | <i>Feet.</i> |
| Valley .....                                                        | McK. & B. R. R. ....         | 1,476        |
| sville .....                                                        | P. & E. R. R. ....           | 583          |
| .....                                                               | P. & C. R. R. ....           | 921          |
| .....                                                               | P. B. R. R. ....             | 538          |
| .....                                                               | P. B. R. R. ....             | 435          |
| .....                                                               | S. W. Pa. Extension .....    | 1,139        |
| .....                                                               | P. & C. R. R. ....           | 1,138        |
| .....                                                               | C. & W. R. R. ....           | 1,095        |
| .....                                                               | P. & E. R. R. ....           | 594          |
| d. ....                                                             | W. C. & P. R. R. ....        | 90           |
| .....                                                               | B. G. R. R. ....             | 2,108        |
| n's .....                                                           | P. & C. R. R. ....           | 1,076        |
| Ferry .....                                                         | N. C. R. R. ....             | 433          |
| Summit .....                                                        | H. & B. T. R. R. ....        | 974          |
| od .....                                                            | E. Pa. R. R. ....            | 449          |
| ity .....                                                           | N. Y., L. E. & W. R. R. .... | 1,460        |
| .....                                                               | S. & S. R. R. ....           | 435          |
| .....                                                               | E. B. & W. R. R. ....        | 576          |
| shington .....                                                      | N. Pa. R. R. ....            | 170          |
| le. ....                                                            | Bed. & Bridge. R. R. ....    | 1,091        |
| Station .....                                                       | A. V. R. R. ....             | 970          |
| lle .....                                                           | S. W. Pa. R. R. ....         | 967          |
| .....                                                               | Pa. R. R. ....               | 1,029        |
| n Mills .....                                                       | P. & C. R. R. ....           | 1,042        |
| h Station .....                                                     | A. V. R. R. ....             | 897          |
| e .....                                                             | Phil. & N. R. R. ....        | 200          |
| lle .....                                                           | M. C. R. R. ....             | 1,479        |
| .....                                                               | A. & G. W. R. R. ....        | 987          |
| Branch Junction at head block of<br>switch .....                    | A. & G. W. R. R. ....        | 1,074        |
| .....                                                               | L. S. & M. S. R. R. ....     | 1,017        |
| own .....                                                           | B. & O. R. R. ....           | 783          |
| .....                                                               | Pa. R. R. ....               | 918          |
| .....                                                               | Pa. R. R. ....               | 490          |
| .....                                                               | S. & A. R. R. ....           | 1,177        |
| gh .....                                                            | S. & N. R. R. ....           | 509          |
| .....                                                               | P., Ft. W. & C. R. R. ....   | 703          |
| sburgh .....                                                        | Lehigh Valley R. R. ....     | 225          |
| .....                                                               | L. & S. R. R. ....           | 222          |
| Second Station .....                                                | W. Pa. R. R. ....            | 772          |
| own .....                                                           | Lehigh Valley R. R. ....     | 690          |
| .....                                                               | McK. & B. R. R. ....         | 1,465        |
| n .....                                                             | R. & C. R. R. ....           | 472          |
| .....                                                               | Bennett's Br. R. R. ....     | 1,327        |
| (Water in Pine Creek) .....                                         | J. S., P. C. & B. R. R. .... | 1,259        |
| ersville .....                                                      | Pa. R. R. ....               | 298          |
| .....                                                               | Pa. R. R. ....               | 2,161        |
| 's .....                                                            | N. Y., R. & P. R. R. ....    | 1,432        |
| .....                                                               | Pa. R. R. ....               | 559          |
| .....                                                               | Chester Valley R. R. ....    | 225          |
| .....                                                               | C. & F. R. R. ....           | 469          |
| 's .....                                                            | T. & C. R. R. ....           | 1,568        |
| .....                                                               | D., A. V. & P. R. R. ....    | 1,293        |
| .....                                                               | P. & E. R. R. ....           | 1,306        |
| .....                                                               | B. & O. R. R. ....           | 1,948        |
| Ferry Station .....                                                 | A. V. R. R. ....             | 785          |
| .....                                                               | N. C. & F. R. R. ....        | 1,327        |
| t, B. M. on step of ladies' waiting<br>room, Gaysport Station ..... | Pa. R. R. ....               | 947          |
| own .....                                                           | W. & R. R. R. ....           | 432          |
| .....                                                               | A. & G. W. R. R. ....        | 1,069        |
| Station .....                                                       | Pa. R. R. ....               | 1,196        |
| own .....                                                           | N. C. R. R. ....             | 417          |

| Station.                                                                     | Authority.                   | Elevation.   |
|------------------------------------------------------------------------------|------------------------------|--------------|
|                                                                              |                              | <i>Feet.</i> |
| Germantown Depot .....                                                       | Phil. & R. R. R. ....        | 215          |
| Gillesville .....                                                            | N. Y., L. E. & W. R. R. .... | 2,016        |
| Gillett's .....                                                              | N. C. R. R. ....             | 1,167        |
| Girard .....                                                                 | L. S. & M. S. R. R. ....     | 717          |
| Girard Junction .....                                                        | E. & P. R. R. ....           | 697          |
| Girard Manor Station .....                                                   | C. & W. R. R. ....           | 1,407        |
| Girardville .....                                                            | M. & S. R. R. ....           | 1,021        |
| Glasgow .....                                                                | C. R. R. ....                | 165          |
| Glatfelters .....                                                            | N. C. R. R. ....             | 335          |
| Glen Carbon .....                                                            | M. H. & S. H. R. R. ....     | 1,124        |
| Glencoe .....                                                                | B. & O. R. R. ....           | 1,023        |
| Glendale .....                                                               | P., Ft. W. & C. R. R. ....   | 721          |
| Glendon .....                                                                | L. & S. R. R. ....           | 215          |
| Glen Hall .....                                                              | W. & R. R. R. ....           | 218          |
| Glenlock .....                                                               | Pa. R. R. ....               | 453          |
| Glen Mill .....                                                              | W. C. & P. R. R. ....        | 199          |
| Glen Onoko .....                                                             | Lehigh Valley R. R. ....     | 591          |
| Glen Riddle .....                                                            | W. C. & P. R. R. ....        | 160          |
| Glen Rock .....                                                              | N. C. R. R. ....             | 551          |
| Glen Union .....                                                             | P. & E. R. R. ....           | 605          |
| Glyndon .....                                                                | P., T. & B. R. R. ....       | 1,348        |
| Gold Mine .....                                                              | S. & S. R. R. ....           | 799          |
| Goldboro .....                                                               | N. C. R. R. ....             | 304          |
| Goods .....                                                                  | Pa. R. R. ....               | 1,006        |
| Gordonville .....                                                            | Pa. R. R. ....               | 355          |
| Gowan .....                                                                  | D., H. & W. R. R. ....       | 999          |
| Graham's .....                                                               | N. C. & F. R. R. ....        | 907          |
| Grand Valley .....                                                           | D., A. V. & P. R. R. ....    | 1,341        |
| Grant .....                                                                  | Bennett's Br. R. R. ....     | 975          |
| Granville .....                                                              | N. C. R. R. ....             | 1,368        |
| Do .....                                                                     | Pa. R. R. ....               | 498          |
| Grapeville Station .....                                                     | Pa. R. R. ....               | 1,059        |
| Graters Ford .....                                                           | Perkiomen R. R. ....         | 149          |
| Graybills .....                                                              | Perkiomen R. R. ....         | 426          |
| Gray's Mills .....                                                           | P., T. & B. R. R. ....       | 1,279        |
| Great Belt City, road crossing .....                                         | W. Pa. R. R. ....            | 1,260        |
| Great Bend .....                                                             | Del., L. & W. R. R. ....     | 879          |
| Do .....                                                                     | N. Y., L. E. & W. R. ....    | 884          |
| Greencastle .....                                                            | Cumberland Valley R. R. .... | 586          |
| Do..... B. M. on center of cross in stone<br>in front wall P. R. Depot ..... | U. S. C. & G. S. ....        | 589          |
| Green Land .....                                                             | Perkiomen R. R. ....         | 246          |
| Greensburg Junction .....                                                    | S. W. Pa. R. R. ....         | 1,070        |
| Greensburg Station .....                                                     | Pa. R. R. ....               | 1,091        |
| Green Tree .....                                                             | Pa. R. R. ....               | 543          |
| Greenville .....                                                             | Del., L. & W. R. R. ....     | 1,185        |
| Do .....                                                                     | A. & G. W. R. R. ....        | 984          |
| Do .....                                                                     | E. & P. R. R. ....           | 961          |
| Greenwood .....                                                              | B. R. R. ....                | 823          |
| Do .....                                                                     | W. C. & P. R. R. ....        | 218          |
| Greer's .....                                                                | Chartiers R. R. ....         | 903          |
| Grey's Ferry Bridge .....                                                    | P., W. & B. R. R. ....       | 37           |
| Grinders .....                                                               | W. Pa. R. R. ....            | 827          |
| Grove .....                                                                  | B. & O. R. R. ....           | 784          |
| Do .....                                                                     | P. & E. R. R. ....           | 773          |
| Grover .....                                                                 | N. C. R. R. ....             | 1,220        |
| Gum Stump .....                                                              | B. & S. S. R. R. ....        | 1,020        |
| Guth's .....                                                                 | C. & F. R. R. ....           | 491          |
| Guyer, Half Moon Gap .....                                                   | L. C. & S. R. R. ....        | 1,144        |
| Gwynedd .....                                                                | N. Pa. R. R. ....            | 571          |
| Hadley .....                                                                 | L. S. & M. S. R. R. ....     | 1,071        |
| Hadley's .....                                                               | L. S. & M. S. R. R. ....     | 1,070        |
| Halifax .....                                                                | N. C. R. R. ....             | 361          |
| Halls Station .....                                                          | C. & W. R. R. ....           | 513          |

| Station.                                                                                                                            | Authority.                  | Elevation.   |
|-------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|--------------|
|                                                                                                                                     |                             | <i>Feet.</i> |
| on Catawissa R. R., east bank of river.....                                                                                         | M. C. R. R.....             | 513          |
| .....                                                                                                                               | Phil. & R. R. R.....        | 376          |
| .....                                                                                                                               | McK. & B. R. R.....         | 1,557        |
| .....                                                                                                                               | W. Pa. R. R.....            | 743          |
| .....                                                                                                                               | Pa. R. R.....               | 1,133        |
| .....                                                                                                                               | N. Pa. R. R.....            | 276          |
| .....                                                                                                                               | W. & R. R. R.....           | 223          |
| .....                                                                                                                               | B. V. R. R.....             | 2,073        |
| .....                                                                                                                               | P., C. & St. L. R. R.....   | 942          |
| .....                                                                                                                               | B. E. Valley R. R. R.....   | 1,057        |
| .....                                                                                                                               | L. & S. R. R.....           | 654          |
| .....                                                                                                                               | Pa. R. R.....               | 599          |
| tion.....                                                                                                                           | F. C. R. R.....             | 442          |
| .....                                                                                                                               | L. & S. R. R.....           | 1,005        |
| ion.....                                                                                                                            | W. P. R. R.....             | 802          |
| .....                                                                                                                               | L. S. & M. S. R. R.....     | 731          |
| ion.....                                                                                                                            | L. & Q. R. R.....           | 309          |
| pot.....                                                                                                                            | Pa. R. R.....               | 320          |
| line of depot.....                                                                                                                  | Pa. R. R.....               | 321          |
| estone at lamp post, United States Hotel.....                                                                                       | Pa. R. R.....               | 321          |
| line of Lebanon Valley depot.....                                                                                                   | Pa. R. R.....               | 322          |
| line of State street.....                                                                                                           | Pa. R. R.....               | 326          |
| c. with Pa. R. R. & N. C. R. R. of N. rail, main east bound track, center of Market street (Pa. R. R.).....                         | Cumberland Valley R. R..... | 322          |
| of N. rail, W. line of State st. (Pa. R. R.).....                                                                                   | Cumberland Valley R. R..... | 321          |
| of N. rail, opposite 106th mile post (Pa. R. R.).....                                                                               | Cumberland Valley R. R..... | 327          |
| of N. rail at weighing scales, V. line of house, near 106th mile post.....                                                          | Cumberland Valley R. R..... | 330          |
| of north witness stone to meridian post, near the east entrance to State Capitol building.....                                      | Cumberland Valley R. R..... | 334          |
| M. on sandstone coping, near base of column, S. E. corner of vestibule, east entrance to State Capitol building marked thus +)..... | Cumberland Valley R. R..... | 364          |
| M. on alaty limestone rock, about 20 ft. S. from S. line L. bridge, and 60 feet S. fr. above low-water mark.....                    | Cumberland Valley R. R..... | 368          |
| op of S. rail, E. end of C. lge.....                                                                                                | Cumberland Valley R. R..... | 392          |
| op of S. rail, W. end of C. lge.....                                                                                                | Cumberland Valley R. R..... | 332          |
| M. on projecting course of at base of 1st pier, S. W. cor. V. R. R. bridge.....                                                     | Cumberland Valley R. R..... | 353          |
| M. on center of top surface in capitol grounds.....                                                                                 | Cumberland Valley R. R..... | 397          |
| M. on base pillar at S. E. cor- building.....                                                                                       | U. S. C. & G. S.....        | 357          |
| .....                                                                                                                               | U. S. C. & G. S.....        | 367          |
| .....                                                                                                                               | S. & A. R. R.....           | 1,340        |
| .....                                                                                                                               | N. E. Pa. R. R.....         | 942          |
| .....                                                                                                                               | N. Pa. R. R.....            | 311          |
| .....                                                                                                                               | N. Pa. R. R.....            | 229          |

| Station.                         | Authority.                  | Elevation.   |
|----------------------------------|-----------------------------|--------------|
|                                  |                             | <i>Feet.</i> |
| Haugus.....                      | Berlin R. R.....            | 2,073        |
| Hawk Eye.....                    | S. W. P. A. R. R.....       | 1,067        |
| Hawkins Station.....             | Pa. R. R.....               | 883          |
| Hawk Switch.....                 | N. Valley R. R.....         | 1,221        |
| Hawley.....                      | Del. & Hudson Canal.....    | 880          |
| Do.....                          | N. Y., L. E. & W. R. R..... | 899          |
| Haysville.....                   | P., Ft. W. & C. R. R.....   | 721          |
| Hazardville.....                 | L. & S. R. R.....           | 417          |
| Hazelwood.....                   | B. & O. R. R.....           | 789          |
| Heathville.....                  | Bennett's Br. R. R.....     | 1,161        |
| Hecla.....                       | L. Schuyl. R. R.....        | 590          |
| Heidelberg.....                  | Lebanon Valley R. R.....    | 379          |
| Heilmansdale.....                | L. & T. R. R.....           | 515          |
| Heistand's.....                  | York Branch P. R. R.....    | 437          |
| Helena.....                      | W. Pa. R. R.....            | 1,017        |
| Hellam.....                      | York Branch P. R. R.....    | 348          |
| Hellertown.....                  | N. Pa. R. R.....            | 276          |
| Hemlock.....                     | P. & E. R. R.....           | 1,464        |
| Hemphill.....                    | W., C. & P. R. R.....       | 318          |
| Henderson's.....                 | Chester Valley R. R.....    | 165          |
| Henrietta Junction.....          | Pa. R. R.....               | 1,391        |
| Henry's Bend.....                | P., T. & B. R. R.....       | 1,035        |
| Henryville.....                  | Del., L. & W. R. R.....     | 596          |
| Herman.....                      | W. Pa. R. R.....            | 1,301        |
| Herndon Junction.....            | M. & S. R. R.....           | 431          |
| Herrick Center.....              | N. Y., L. E. & W. R. R..... | 1,770        |
| Herrold's Saw-Mill.....          | S. & N. B. R. R.....        | 415          |
| Hess Station.....                | L. & Q. R. R.....           | 424          |
| Hestonville.....                 | Pa. R. R.....               | 143          |
| Hexenberg.....                   | U. & N. F. R. R.....        | 1,415        |
| Hibernia.....                    | W. & R. R. R.....           | 530          |
| Hickory.....                     | P., T. & B. R. R.....       | 1,091        |
| Hickory Run.....                 | Lehigh Valley R. R.....     | 1,016        |
| Hick's Ferry.....                | Del., L. & W. R. R.....     | 521          |
| High Bridge.....                 | N. Y. & N. R. R.....        | 8            |
| Highland.....                    | P., Ft. W. & C. R. R.....   | 1,043        |
| High Rock, B. M.....             | P. B. R. R.....             | 383          |
| Highspire.....                   | Pa. R. R.....               | 300          |
| Hill's.....                      | Chartiers R. R.....         | 890          |
| Hillsborough.....                | Cumberland Tp'k.....        | 1,750        |
| Hillside.....                    | Pa. R. R.....               | 1,129        |
| Hill's Mills.....                | W. Pa. R. R.....            | 780          |
| Hilltop.....                     | N. Pa. R. R.....            | 555          |
| Hilltown.....                    | N. C. & B. V. R. R.....     | 799          |
| Hillville Station.....           | A. V. R. R.....             | 865          |
| Hoggett's.....                   | P. & C. R. R.....           | 978          |
| Hoggett's Mill.....              | S. W. Pa. Extension.....    | 961          |
| Hokendauqua.....                 | Lehigh Valley R. R.....     | 295          |
| Holliday.....                    | C., C. & A. R. R.....       | 1,151        |
| Holidaysburg.....                | Pa. R. R.....               | 953          |
| Do.....draw-bridge.....          | Pa. R. R.....               | 943          |
| Homestead.....                   | P., V. & C. R. R.....       | 761          |
| Hometown.....                    | N. Valley R. R.....         | 1,176        |
| Homewood.....                    | Pa. R. R.....               | 923          |
| Do.....N. C. & B. V. R. R.....   | P., Ft. W. & C. R. R.....   | 949          |
| Do.....P., Ft. W. & C. R. R..... | N. C. & B. V. R. R.....     | 950          |
| Honesdale.....                   | Del. & Hudson Canal.....    | 965          |
| Do.....                          | N. Y., L. E. & W. R. R..... | 966          |
| Honeybrook.....                  | W. & R. R. R.....           | 506          |
| Honeycreek.....                  | M. & C. Co. R. R.....       | 647          |
| Hood's Road.....                 | W. C. R. R.....             | 595          |
| Hopbottom.....                   | D., L. & W. R. R.....       | 898          |
| Hope Mills.....                  | N. C. & F. R. R.....        | 1,107        |
| Hopes.....                       | L. & S. R. R.....           | 219          |

| Station.                                                | Authority.                   | Elevation.   |
|---------------------------------------------------------|------------------------------|--------------|
|                                                         |                              | <i>Feet.</i> |
| l .....                                                 | H. & B. T. R. R. ....        | 898          |
| s .....                                                 | Chartiers R. R. ....         | 949          |
| .....                                                   | Pa. R. R. ....               | 1,056        |
| .....                                                   | B. F. Valley R. R. ....      | 679          |
| Hill .....                                              | N. Y., L. E. & W. R. R. .... | 2,230        |
| Summit .....                                            | N. Y., R. & P. R. R. ....    | 2,235        |
| ille .....                                              | Chester Valley R. R. ....    | 221          |
| .....                                                   | S. W. Pa. R. R. ....         | 1,001        |
| lle .....                                               | M. C. R. R. ....             | 600          |
| station .....                                           | A. V. R. R. ....             | 778          |
| stown .....                                             | Lebanon Valley R. R. ....    | 376          |
| .....                                                   | S. W. Pa. R. R. ....         | 945          |
| .....                                                   | P., T. & B. R. R. ....       | 1,061        |
| .....                                                   | M. R. R. ....                | 1,547        |
| don .....                                               | H. & B. T. R. R. ....        | 621          |
| don Valley .....                                        | Phil. & N. R. R. ....        | 117          |
| .....                                                   | P. & E. R. R. ....           | 861          |
| n .....                                                 | P., T. & B. R. R. ....       | 1,252        |
| .....                                                   | P. & E. R. R. ....           | 644          |
| .....                                                   | P., C. & St. L. R. R. ....   | 847          |
| .....                                                   | P., T. & B. R. R. ....       | 1,008        |
| reek .....                                              | B. & O. R. R. ....           | 990          |
| .....                                                   | P., C. & St. L. R. R. ....   | 871          |
| ion .....                                               | A. V. R. R. ....             | 748          |
| ls .....                                                | Bennett's Br. R. R. ....     | 1,299        |
| ge .....                                                | Pa. R. R. ....               | 496          |
| .....                                                   | P. & C. R. R. ....           | 1,051        |
| se .....                                                | C. R. R. ....                | 312          |
| .....                                                   | D., A. V. & P. R. R. ....    | 1,164        |
| .....                                                   | P. & E. R. R. ....           | 1,172        |
| Junction, with P. & E. R. R. ....                       | P., T. & B. R. R. ....       | 1,171        |
| .....                                                   | L. & T. R. R. ....           | 499          |
| ation .....                                             | Pa. R. R. ....               | 884          |
| .....                                                   | W. R. R. R. ....             | 639          |
| .....                                                   | D., A. V. & P. R. R. ....    | 1,181        |
| Centre .....                                            | N. C. & F. R. R. ....        | 1,257        |
| .....                                                   | P. & E. R. R. ....           | 1,230        |
| in .....                                                | P., Ft. W. & C. R. R. ....   | 728          |
| n .....                                                 | Pa. R. R. ....               | 595          |
| reek .....                                              | B. & O. R. R. ....           | 797          |
| .....                                                   | S. W. Pa. R. R. ....         | 1,034        |
| fill .....                                              | Pa. R. R. ....               | 504          |
| n .....                                                 | L. S. & M. S. R. R. ....     | 990          |
| crossing E. & P. R. R. ....                             | L. S. & M. S. R. R. ....     | 990          |
| crossing Franklin Division, L.<br>S. & M. S. R. R. .... | E. & P. R. R. ....           | 979          |
| .....                                                   | P., T. & B. R. R. ....       | 1,073        |
| .....                                                   | L. & S. R. R. ....           | 1,618        |
| .....                                                   | S. & S. R. R. ....           | 531          |
| wn Junction .....                                       | N. Pa. R. R. ....            | 203          |
| .....                                                   | L. R. R. ....                | 971          |
| ills .....                                              | J. S., P. C. & B. R. R. .... | 653          |
| ore .....                                               | P. & E. R. R. ....           | 593          |
| Main street .....                                       | J. S., P. C. & B. R. R. .... | 548          |
| .....                                                   | W. & R. R. R. ....           | 627          |
| gh .....                                                | N. Y., L. E. & W. R. R. .... | 1,461        |
| .....                                                   | P. & E. R. R. ....           | 1,442        |
| ines .....                                              | M. C. R. R. ....             | 805          |
| .....                                                   | Chartiers R. R. ....         | 971          |
| Station .....                                           | A. V. R. R. ....             | 760          |
| n .....                                                 | Pa. R. R. ....               | 1,184        |
| try .....                                               | P., C. & St. L. R. R. ....   | 757          |
| n .....                                                 | L. & T. R. R. ....           | 422          |
| .....                                                   | B. E. Valley R. R. ....      | 851          |

(381)



| Station.                                                                              | Authority.                  | Elevation.   |
|---------------------------------------------------------------------------------------|-----------------------------|--------------|
|                                                                                       |                             | <i>Feet.</i> |
| Junction with P., Ft. W. & C. R. R.....                                               | W. Pa. R. R.....            | 739          |
| Kalmia Colliery.....                                                                  | L. & T. R. R.....           | 1,237        |
| Kane.....                                                                             | P. & E. R. R.....           | 2,014        |
| Karn's.....                                                                           | W. Pa. R. R.....            | 768          |
| Karns City.....                                                                       | P. & K. C. R. R.....        | 1,204        |
| Kassons.....                                                                          | E. & P. R. R.....           | 1,111        |
| Kantz P. O., water's edge, ordinary low<br>water, middle creek.....                   | S. & N. R. R.....           | 448          |
| Kearney's Station.....                                                                | Pa. R. R.....               | 1,048        |
| Keating.....                                                                          | P. & E. R. R.....           | 718          |
| Do. (Summit).....                                                                     | B., N. Y. & P. R. R.....    | 1,881        |
| Keensville.....                                                                       | S. & N. B. R. R.....        | 447          |
| Kelley Station.....                                                                   | A. V. R. R.....             | 781          |
| Kelly, State Agricultural College.....                                                |                             | 1,111        |
| Kelleyville.....                                                                      | W., C. & P. R. R.....       | 102          |
| Kennett Square.....                                                                   | P. & B. C. R. R.....        | 260          |
| Keystone.....                                                                         | M. & S. R. R.....           | 1,033        |
| Do. Keystone Coal and Manf. Co.....                                                   | S. R. R.....                | 1,976        |
| Kilbourne's (Water, Pine Creek).....                                                  | J. S., P. C. & B. R. R..... | 1,301        |
| Kimberton.....                                                                        | Pickering Valley R. R.....  | 211          |
| Kimbles.....                                                                          | N. Y., L. E. & W. R. R..... | 851          |
| King of Prussia.....                                                                  | Chester Valley R. R.....    | 180          |
| Kingston.....                                                                         | Del., L. & W. R. R.....     | 568          |
| Kinzers.....                                                                          | Pa. R. R.....               | 463          |
| Kinzua.....                                                                           | N. Y., R. & P. R. R.....    | 1,956        |
| Kinzua Viaduct.....                                                                   | N. Y., L. E. & W. R. R..... | 2,110        |
| Kipp's Run.....                                                                       | D., H. & W. R. R.....       | 463          |
| Kirkland.....                                                                         | W. C. R. R.....             | 548          |
| Kittanning.....                                                                       | Pa. R. R.....               | 1,594        |
| Do. top of curbstone on street cor-<br>ner in front of Valley Cen-<br>tral Hotel..... | A. V. R. R.....             | 810          |
| Kline's Grove.....                                                                    | D., H. & W. R. R.....       | 445          |
| Koffles Gap.....                                                                      | N. Pa. R. R.....            | 530          |
| Krebs.....                                                                            | C. & W. R. R.....           | 1,225        |
| Laceyville.....                                                                       | Lehigh Valley R. R.....     | 658          |
| Lackawanna.....                                                                       | Del., L. & W. R. R.....     | 637          |
| Do.....                                                                               | N. Y., L. E. & W. R. R..... | 648          |
| Do. Junction.....                                                                     | Lehigh Valley R. R.....     | 569          |
| La Fayette.....                                                                       | Phil. & R. R. R.....        | 53           |
| Lagrange.....                                                                         | Lehigh Valley R. R.....     | 598          |
| Lakeville.....                                                                        | U. & T. R. R.....           | 1,412        |
| Lamoka.....                                                                           | B. R. R.....                | 1,048        |
| Lamokin Junction.....                                                                 | P., W. & B. R. R.....       | 37           |
| Lancaster Junction.....                                                               | R. & C. R. R.....           | 378          |
| Do. B. M. on stone wall,<br>Lancaster Locomo-<br>tive Works.....                      | Pa. R. R.....               | 359          |
| Lancaster Pike.....                                                                   | E. B. & W. R. R.....        | 696          |
| Landingville.....                                                                     | Phil. & R. R. R.....        | 503          |
| Landisburgh.....                                                                      | Levels.....                 | 740          |
| Landisville.....                                                                      | R. & C. R. R.....           | 404          |
| Do. R. & Col. R. R. Crossing.....                                                     | Pa. R. R.....               | 405          |
| Lanes Mill.....                                                                       | N. Y., R. & P. R. R.....    | 1,487        |
| Langdons.....                                                                         | P. & E. R. R.....           | 1,135        |
| Langigan Furnace.....                                                                 | M. C. R. R.....             | 717          |
| Lansdale Junction.....                                                                | N. Pa. R. R.....            | 368          |
| Larabee.....                                                                          | B., N. Y. & P. R. R.....    | 1,481        |
| Larimer's Station.....                                                                | Pa. R. R.....               | 866          |
| Latrobe.....                                                                          | Pa. R. R.....               | 1,006        |
| Laubachs.....                                                                         | L. & S. R. R.....           | 304          |
| Laughlin.....                                                                         | B. & O. R. R.....           | 770          |
| Laurel.....                                                                           | P. B. R. R.....             | 412          |
| Do.....                                                                               | W. & R. R. R.....           | 241          |

| Station.                                                                                             | Authority.                      | Elevation.   |
|------------------------------------------------------------------------------------------------------|---------------------------------|--------------|
|                                                                                                      |                                 | <i>Feet.</i> |
| <b>Laurel Hill</b> .....                                                                             | Levels .....                    | 2,495        |
| <b>Laurel Run</b> .....                                                                              | B. & O. R. R. ....              | 856          |
| <b>Laurelton</b> .....                                                                               | L., C. & S. C. R. R. ....       | 607          |
| <b>Laurys</b> .....                                                                                  | Lehigh Valley R. R. ....        | 329          |
| <b>Lawrence Junction</b> .....                                                                       | N. C. & B. V. R. R. ....        | 774          |
| <b>Lawrenceville</b> .....                                                                           | Tioga R. R. ....                | 1,006        |
| Do..... Station.....                                                                                 | Pa. R. R. ....                  | 780          |
| <b>Lawsonham</b> .....                                                                               | Bennett's Br. R. R. ....        | 919          |
| Do.....                                                                                              | A. V. R. R. ....                | 916          |
| <b>Layton</b> .....                                                                                  | B. & O. R. R. ....              | 818          |
| <b>Leaman Place</b> .....                                                                            | Pa. R. R. ....                  | 382          |
| <b>Leadale</b> .....                                                                                 | Chartiers R. R. ....            | 794          |
| <b>Leatherwood</b> .....                                                                             | Bennett's Br. R. R. ....        | 1,027        |
| <b>Lebanon</b> .....                                                                                 | Lebanon Valley R. R. ....       | 466          |
| Do..... Junction .....                                                                               | L. & T. R. R. ....              | 468          |
| Do... B. M. on center of cross in front of<br>wall of Saint Mary's Church...                         | U. S. C. & G. S. ....           | 475          |
| Do... B. M. on top of marble post,<br>corner 8th and Church streets,<br>grounds of P. L. Weiner..... | U. S. C. & G. S. ....           | 466          |
| <b>Le Boeuf</b> .....                                                                                | P. & E. R. R. ....              | 1,217        |
| <b>Lees</b> .....                                                                                    | Chester Valley R. R. ....       | 279          |
| <b>Leesburg</b> .....                                                                                | N. C. & F. R. R. ....           | 1,045        |
| <b>Leesport</b> .....                                                                                | Phil. & R. R. R. ....           | 298          |
| <b>Leetsdale</b> .....                                                                               | P., Ft. W. & C. R. R. ....      | 715          |
| <b>Lehigh Gap</b> .....                                                                              | L. & S. R. R. ....              | 393          |
| Do.....                                                                                              | Lehigh Valley R. R. ....        | 389          |
| <b>Leighton</b> .....                                                                                | L. & S. R. R. ....              | 494          |
| Do.....                                                                                              | Leigh Valley R. R. ....         | 466          |
| <b>Lemon</b> .....                                                                                   | M. R. R. ....                   | 1,041        |
| <b>Lemont</b> .....                                                                                  | L., C. & S. C. R. R. ....       | 1,002        |
| Do.....                                                                                              | S. W. Pa. Extension.....        | 1,030        |
| <b>Lemont's</b> .....                                                                                | P. & C. R. R. ....              | 1,084        |
| <b>Lenape</b> .....                                                                                  | W. & R. R. R. ....              | 183          |
| <b>Lenzi</b> .....                                                                                   | W., C. & P. R. R. ....          | 136          |
| <b>Leonard's Point</b> .....                                                                         | T. & C. R. R. ....              | 1,306        |
| <b>Lewisburgh</b> .....                                                                              | L., C. & S. C. R. R. ....       | 466          |
| <b>Lewis' Mills</b> .....                                                                            | E. B. & W. R. R. ....           | 542          |
| <b>Lewiston</b> .....                                                                                | Pa. R. R. ....                  | 498          |
| Do..... junction with Pa. R. R. ....                                                                 | Mifflin & Center Co. R. R. .... | 499          |
| <b>Liberty</b> .....                                                                                 | B., N. Y. & P. R. R. ....       | 1,646        |
| Do..... Spring .....                                                                                 | T. & C. R. R. ....              | 1,103        |
| <b>Ligonier</b> .....                                                                                | Ligonier Valley R. R. ....      | 1,748        |
| <b>Lilly</b> .....                                                                                   | E. & C. R. R. ....              | 2,030        |
| <b>Lillys</b> .....                                                                                  | Pa. R. R. ....                  | 1,887        |
| <b>Limerick</b> .....                                                                                | Phil. & R. R. R. ....           | 138          |
| <b>Lime Ridge</b> .....                                                                              | Del., L. & W. R. R. ....        | 509          |
| <b>Lime Valley Station</b> .....                                                                     | L. & Q. R. R. ....              | 384          |
| <b>Lincolnville</b> .....                                                                            | U. & T. R. R. ....              | 1,392        |
| <b>Linden</b> .....                                                                                  | P. & E. R. R. ....              | 533          |
| Do..... Surface of canal .....                                                                       | J. S., P. C. & B. R. R. ....    | 528          |
| <b>Lindorff's Summit</b> .....                                                                       | Pa. R. R. ....                  | 1,185        |
| <b>Linesville</b> .....                                                                              | E. & P. R. R. ....              | 1,033        |
| <b>Linwood</b> .....                                                                                 | P., W. & B. R. R. ....          | 31           |
| <b>Littis</b> .....                                                                                  | R. & C. R. R. ....              | 375          |
| <b>Little Cooley</b> .....                                                                           | P. & P. R. R. ....              | 1,203        |
| <b>Littletown</b> .....                                                                              | Pa. R. R. ....                  | 619          |
| <b>Livengood's Mill</b> .....                                                                        | S. R. R. ....                   | 2,001        |
| <b>Livermore</b> .....                                                                               | W. Pa. R. R. ....               | 945          |
| <b>Liverpool</b> .....                                                                               | N. C. R. R. ....                | 396          |
| Do..... Center of Market street.....                                                                 | S. & N. R. R. ....              | 409          |
| <b>Lloyd's Junction</b> .....                                                                        | B. G. R. R. ....                | 2,167        |
| <b>Lock Haven, junction with B. E. V. R. R.</b> .....                                                | P. & E. R. R. ....              | 556          |
| <b>Lockport</b> .....                                                                                | L. & S. R. R. ....              | 356          |

| Station.                                | Authority.                | Elevation.   |
|-----------------------------------------|---------------------------|--------------|
|                                         |                           | <i>Feet.</i> |
| Lockport.....                           | Pa. R. R.....             | 1,054        |
| Lock Ridge.....                         | C. & F. R. R.....         | 440          |
| Locust Gap Junction.....                | M. & S. R. R.....         | 1,037        |
| Logan.....                              | M. & C. Co. R. R.....     | 512          |
| Logan's Ferry Station.....              | A. V. R. R.....           | 757          |
| Logansport Station.....                 | A. V. R. R.....           | 785          |
| Long Run.....                           | B. & O. R. R.....         | 765          |
| Lovells.....                            | P. & E. R. R.....         | 1,364        |
| Lower Catasaunqua.....                  | L. & S. R. R.....         | 271          |
| Lowrie, at Warrior's Mark.....          | L. C. & S. C. R. R.....   | 1,109        |
| Ludlow.....                             | P. & E. R. R.....         | 1,603        |
| Lutzville.....                          | Bed. & Bridge. R. R.....  | 1,045        |
| Lycoming Creek Bridge.....              | C. & W. R. R.....         | 589          |
| Lykenstown.....                         | S. B. R. R.....           | 677          |
| Lykens V. R. R. Junction.....           | N. C. R. R.....           | 390          |
| Lynn.....                               | M. R. R.....              | 1,032        |
| Lyon (Pa. Furnace).....                 | L. C. & S. C. R. R.....   | 1,074        |
| Lyons.....                              | E. Pa. R. R.....          | 471          |
| McAlisterville.....                     | S. & N. R. R.....         | 661          |
| McAuley.....                            | C. & W. R. R.....         | 759          |
| McCalls.....                            | W. C. R. R.....           | 463          |
| McCall's Ferry.....                     | C. & P. D. R. R.....      | 169          |
| McCandless.....                         | A. V. R. R.....           | 740          |
| McClintock.....                         | P., T. & B. R. R.....     | 1,058        |
| McConnellstown.....                     | H. & B. T. R. R.....      | 674          |
| McDonald's.....                         | P., C. & St. L. R. R..... | 979          |
| McKean's Corner.....                    | P. & P. R. R.....         | 1,053        |
| McKee's Half Falls.....                 | S. & N. B. R. R.....      | 411          |
| McKeesport.....                         | B. & O. R. R.....         | 765          |
| McKune's.....                           | Lehigh Valley R. R.....   | 596          |
| McMiuns Summit.....                     | N. Y., R. & P. R. R.....  | 1,615        |
| McVeytown.....                          | Pa. R. R.....             | 592          |
| Magee.....                              | P., T. & B. R. R.....     | 1,131        |
| Magee's.....                            | Phila. & R. R. R.....     | 64           |
| Maghee's.....                           | Bennett's Br. R. R.....   | 1,387        |
| Mahanoy City Depot.....                 | E. M. R. R.....           | 1,343        |
| Mahantonga.....                         | N. C. R. R.....           | 405          |
| Mahonington.....                        | N. C. & B. V. R. R.....   | 759          |
| Mainville.....                          | D., H. & W. R. R.....     | 589          |
| Maltby Station.....                     | Del., L. & W. R. R.....   | 558          |
| Malvern.....                            | Pa. R. R.....             | 546          |
| Manatawny.....                          | C. R. R.....              | 192          |
| Manayunk.....                           | Phil. & R. R. R.....      | 57           |
| Do.....                                 | Pa. R. R.....             | 519          |
| Manchester.....                         | W. C. & P. R. R.....      | 211          |
| Manheim.....                            | R. & C. R. R.....         | 402          |
| Manns.....                              | M. & C. Co. R. R.....     | 573          |
| Mann's Choice.....                      | Bed. & Bridge. R. R.....  | 1,136        |
| Mauor.....                              | W. & R. R. R.....         | 572          |
| Do Station.....                         | Pa. R. R.....             | 942          |
| Manonville.....                         | A. V. R. R.....           | 798          |
| Mansfield.....                          | Tioga R. R.....           | 1,140        |
| Do .. junction with Chartiers R. R..... | P., C. & St. L. R. R..... | 773          |
| Mantua.....                             | Pa. R. R.....             | 101          |
| Mapleton.....                           | Pa. R. R.....             | 523          |
| Marcy.....                              | M. R. R.....              | 945          |
| Marietta.....                           | Pa. R. R.....             | 800          |
| Marklesburg.....                        | H. & B. T. R. R.....      | 789          |
| Martha.....                             | B. E. Valley R. R.....    | 912          |
| Do. Furnace.....                        | Pa. R. R.....             | 1,054        |
| Martinsburg.....                        | P. & K. C. R. R.....      | 1,104        |
| Do.....                                 | Pa. R. R.....             | 1,366        |
| Do .. junction.....                     | Pa. R. R.....             | 1,344        |
| Marysville.....                         | Pa. R. R.....             | 350          |

| Station.                                                                                                  | Authority.                   | Elevation.   |
|-----------------------------------------------------------------------------------------------------------|------------------------------|--------------|
|                                                                                                           |                              | <i>Feet.</i> |
| <b>Marysville</b> . W. end of R. R. bridge .....                                                          | N. C. R. R. ....             | 349          |
| Do .... B. M. on hard sandstone, perpendicular from S. line of bridge, about 40 feet W. of 1st pier ..... | N. C. R. R. ....             | 312          |
| <b>Masontown</b> , Barclay R. R. Bridge .....                                                             | B. R. R. ....                | 794          |
| <b>Mauch Chunk</b> .....                                                                                  | Lehigh Valley R. R. ....     | 544          |
| Do .....                                                                                                  | L. & S. R. R. ....           | 532          |
| <b>Maysville</b> .....                                                                                    | Bennett's Br. R. R. ....     | 1,108        |
| <b>Meadville</b> .....                                                                                    | A. & G. W. R. R. ....        | 1,080        |
| <b>Mechanicsburgh</b> .....                                                                               | Cumberland Valley R. R. .... | 436          |
| Do ..... junc. with C. Valley R. R. ....                                                                  | M. & D. R. R. ....           | 427          |
| <b>Media</b> .....                                                                                        | W. C. & P. R. R. ....        | 210          |
| <b>Medie's Run Bridge</b> , B. M. on top of capston, N. E. cor., W. abutment .....                        | Bennett's Br. R. R. ....     | 1,097        |
| <b>Mehoopany</b> .....                                                                                    | Lehigh Valley R. R. ....     | 634          |
| <b>Mellvale</b> .....                                                                                     | N. C. R. R. ....             | 168          |
| <b>Menge's Mill</b> .....                                                                                 | Pa. R. R. ....               | 455          |
| <b>Mercer</b> .....                                                                                       | N. C. & F. R. R. ....        | 1,097        |
| Do .....                                                                                                  | S. & A. R. R. ....           | 1,108        |
| <b>Merion</b> .....                                                                                       | Pa. R. R. ....               | 247          |
| Do .....                                                                                                  | Phil. & R. R. R. ....        | 81           |
| <b>Mertztown</b> .....                                                                                    | E. Pa. R. R. ....            | 455          |
| <b>Meshopper</b> .....                                                                                    | Lehigh Valley R. R. ....     | 644          |
| <b>Mexico</b> .....                                                                                       | Pa. R. R. ....               | 433          |
| <b>Meyersdale</b> .....                                                                                   | S. R. R. ....                | 1,964        |
| Do .... L. & B. R. R. ....                                                                                | B. & O. R. R. ....           | 2,065        |
| <b>Meyer's Switch</b> .....                                                                               | P., T. & B. R. R. ....       | 1,243        |
| <b>Middaugs</b> .....                                                                                     | N. Y., L. E. & W. R. R. .... | 615          |
| <b>Middlebury</b> .....                                                                                   | C., C. & A. R. R. ....       | 1,178        |
| <b>Middleport</b> .....                                                                                   | Schuylkill Valley R. R. .... | 724          |
| <b>Middlesex</b> .....                                                                                    | E. & P. R. R. ....           | 833          |
| <b>Middletown</b> .....                                                                                   | Pa. R. R. ....               | 314          |
| <b>Middletown Ferry</b> .....                                                                             | N. C. R. R. ....             | 307          |
| <b>Middletown Junction</b> , Col. Br. ....                                                                | Pa. R. R. ....               | 314          |
| <b>Midmont</b> .....                                                                                      | N. Y., L. E. & W. R. R. .... | 2,101        |
| <b>Midway</b> .....                                                                                       | L. S. & M. S. R. R. ....     | 996          |
| Do .....                                                                                                  | Pa. R. R. ....               | 394          |
| Do .....                                                                                                  | P., C. & St. L. R. R. ....   | 1,106        |
| <b>Mifflin</b> .....                                                                                      | L. & T. R. R. ....           | 490          |
| Do .....                                                                                                  | Pa. R. R. ....               | 441          |
| <b>Mifflinburgh</b> .....                                                                                 | L., C. & S. C. R. R. ....    | 565          |
| <b>Mifflin Cross-roads</b> .....                                                                          | D., H. & W. R. R. ....       | 811          |
| <b>Mill Post</b> .....                                                                                    | A. V. R. R. ....             | 746          |
| <b>Milesburgh</b> .....                                                                                   | Bellefonte Branch R. R. .... | 700          |
| <b>Milford</b> .....                                                                                      | S. & M. P. R. R. ....        | 1,932        |
| <b>Mill Creek</b> .....                                                                                   | Pa. R. R. ....               | 604          |
| <b>Mill Creek Junction</b> .....                                                                          | M. C. R. R. ....             | 633          |
| <b>Miller, Logan's Run</b> .....                                                                          | L., C. & S. C. R. R. ....    | 1,070        |
| <b>Millers</b> .....                                                                                      | A. & G. W. R. R. ....        | 1,169        |
| Do .....                                                                                                  | S. L. & S. R. R. ....        | 1,330        |
| <b>Millersburgh</b> .....                                                                                 | S. B. R. R. ....             | 397          |
| Do ..... junction with L. V. C. R. R. ....                                                                | N. C. R. R. ....             | 396          |
| <b>Miller's Farm</b> .....                                                                                | P., T. & B. R. R. ....       | 1,131        |
| <b>Miller's Mill</b> .....                                                                                | S. & N. R. R. ....           | 487          |
| <b>Miller's Station</b> .....                                                                             | Bennett's Br. R. R. ....     | 905          |
| <b>Millerstown</b> .....                                                                                  | E. Pa. R. R. ....            | 383          |
| Do .....                                                                                                  | Pa. R. R. ....               | 408          |
| <b>Millerton</b> .....                                                                                    | T. & E. & S. L. R. R. ....   | 1,246        |
| <b>Millgrove</b> .....                                                                                    | Yough. R. R. ....            | 867          |
| <b>Mill Hall</b> .....                                                                                    | B. & E. Valley R. R. ....    | 573          |
| <b>Mill Lane</b> .....                                                                                    | Chester Valley R. R. ....    | 315          |
| <b>Millmont</b> .....                                                                                     | L., C. & S. C. R. R. ....    | 585          |

| Station.                                                         | Authority.                  | Elevation.   |
|------------------------------------------------------------------|-----------------------------|--------------|
|                                                                  |                             | <i>Fest.</i> |
| Millvale Station.....                                            | Pa. R. R.....               | 833          |
| Mill Village.....                                                | A. & G. W. R. R.....        | 1,216        |
| Millville.....                                                   | N. Y., L. E. & W. R. R..... | 780          |
| Do.....                                                          | Bennett's Br. R. R.....     | 1,098        |
| Millwood.....                                                    | Pa. R. R.....               | 1,155        |
| Milroy.....                                                      | M. & C. Co. R. R.....       | 746          |
| Milton.....                                                      | P. & E. R. R.....           | 473          |
| Do.....                                                          | C. & W. R. R.....           | 465          |
| Mineral Point.....                                               | Pa. R. R.....               | 1,414        |
| Do..... junction with B. & O. R. R.,<br>Pittsburgh Division..... | S. & M. P. R. R.....        | 1,824        |
| Do..... S. & M. P. R. R. junction.....                           | B. & O. R. R.....           | 1,825        |
| Minersville.....                                                 | M. H. & S. H. R. R.....     | 700          |
| Mingo.....                                                       | Phil. & R. R. R.....        | 116          |
| Minnequa.....                                                    | N. C. R. R.....             | 1,230        |
| Mintzer's.....                                                   | C. & W. R. R.....           | 964          |
| Modena.....                                                      | W. & R. R. R.....           | 278          |
| Mohrsville.....                                                  | Phil. & R. R. R.....        | 302          |
| Monckton.....                                                    | N. C. R. R.....             | 344          |
| Monocacy.....                                                    | Phil. & R. R. R.....        | 162          |
| Monongahela City.....                                            | P. V. & C. R. R.....        | 753          |
| Monroe Station.....                                              | W. Pa. R. R.....            | 840          |
| Monroeton, junction with S., L. & E. R. R.....                   | B. R. R.....                | 762          |
| Mont Alto Junction.....                                          | Cumberland Valley R. R..... | 714          |
| Do..... near the furnace.....                                    | Mt. A. R. R.....            | 968          |
| Montandon, junction of L. C. & S. C. R. R.....                   | P. & E. R. R.....           | 462          |
| Monterey Station.....                                            | A. V. R. R.....             | 875          |
| Montgomery.....                                                  | C. & W. R. R.....           | 456          |
| Do.....                                                          | P. & E. R. R.....           | 480          |
| Montoursville.....                                               | C. & W. R. R.....           | 525          |
| Montrose.....                                                    | M. R. R.....                | 1,656        |
| Montrose Station.....                                            | Del., L. & W. R. R.....     | 1,053        |
| Mooreheads.....                                                  | L. S. & M. S. R. R.....     | 768          |
| Mooresburgh.....                                                 | C. & W. R. R.....           | 618          |
| Moore's.....                                                     | P., W. & B. R. R.....       | 94           |
| Moorestown.....                                                  | E. B. & W. R. R.....        | 443          |
| Moravia.....                                                     | N. C. & B. V. R. R.....     | 806          |
| Moredale.....                                                    | H. & B. T. R. R.....        | 1,680        |
| Morgans.....                                                     | P. & C. R. R.....           | 944          |
| Morganza.....                                                    | Chartiers R. R.....         | 938          |
| Morning Side Station.....                                        | A. V. R. R.....             | 747          |
| Morrisville, N. E. side of Wash. street.....                     | Phil. & T. R. R.....        | 34           |
| Morton.....                                                      | W. C. & P. R. R.....        | 121          |
| Mortonville.....                                                 | W. & R. R. R.....           | 900          |
| Moscow.....                                                      | Del., L. & W. R. R.....     | 1,558        |
| Mount Bartow.....                                                | C. R. R.....                | 469          |
| Mount Braddock.....                                              | S. W. Pa. Extension.....    | 1,203        |
| Do.....                                                          | P. & C. R. R.....           | 1,175        |
| Mount Carbon.....                                                | Phil. & R. R. R.....        | 606          |
| Mount Carmel.....                                                | N. C. R. R.....             | 1,054        |
| Mount Dallas.....                                                | Bed. & Bridge. R. R.....    | 1,053        |
| Mount Eagle.....                                                 | B. E. Valley R. R.....      | 662          |
| Mount Joy, east side of R. R. hotel.....                         | Pa. R. R.....               | 368          |
| Mount Pleasant.....                                              | Bennett's Branch R. R.....  | 999          |
| Do.....                                                          | T. & C. R. R.....           | 1,784        |
| Do.....                                                          | P. & C. R. R.....           | 1,066        |
| Mount Union, junction of E. B. T. R. R.<br>(narrow gauge).....   | Pa. R. R.....               | 597          |
| Mountville.....                                                  | Pa. R. R.....               | 404          |
| Mount Wolf.....                                                  | N. C. R. R.....             | 376          |
| Muddy Creek Forks, B. M.....                                     | P. B. R. R.....             | 367          |
| Mud Pike.....                                                    | S. & M. P. R. R.....        | 2,016        |
| Muncy.....                                                       | C. & W. R. R.....           | 495          |
| Do.....                                                          | P. & E. R. R.....           | 519          |

| Station.                                                                         | Authority.                   | Elevation.   |
|----------------------------------------------------------------------------------|------------------------------|--------------|
|                                                                                  |                              | <i>Feet.</i> |
| .....                                                                            | Cumberland Tp'k .....        | 1,065        |
| cks .....                                                                        | Pa. R. R. ....               | 1,626        |
| y .....                                                                          | L. & T. R. R. ....           | 456          |
| town .....                                                                       | Lebanon Valley R. R. ....    | 474          |
| y .....                                                                          | M. & C. Co. R. R. ....       | 678          |
| oke .....                                                                        | Del., L. & W. R. R. ....     | 538          |
| .....                                                                            | Bed. & Bridge. R. R. ....    | 1,108        |
| .....                                                                            | L. S. & M. S. R. R. ....     | 1,165        |
| a .....                                                                          | E. & P. R. R. ....           | 821          |
| ia .....                                                                         | W. Pa. R. R. ....            | 768          |
| l .....                                                                          | C., C. & A. R. R. ....       | 1,186        |
| o .....                                                                          | N. C. & F. R. R. ....        | 1,060        |
| nock Falls .....                                                                 | N. C. & F. R. R. ....        | 992          |
| ehoning .....                                                                    | N. Valley R. R. ....         | 801          |
| lbany .....                                                                      | S. L. & S. R. R. ....        | 1,197        |
| erlin .....                                                                      | C. R. R. ....                | 364          |
| erry .....                                                                       | P. & E. R. R. ....           | 529          |
| ethlehem .....                                                                   | Bennett's Branch R. R. ....  | 1,080        |
| ridge .....                                                                      | H. & B. T. R. R. ....        | 831          |
| Brighton .....                                                                   | P., Ft. W. & C. R. R. ....   | 750          |
| uffalo, water in mill-race .....                                                 | S. & N. B. R. R. ....        | 377          |
| astle .....                                                                      | M. C. R. R. ....             | 876          |
| o .... junction with N. C. Br. of P., Ft.<br>W. & C. R. R. ....                  | E. & P. R. R. ....           | 809          |
| o .... junction with E. & P. R. R. ....                                          | N. C. & B. V. R. R. ....     | 803          |
| o .... junction with N. C. & B. V. R. R.<br>half mile south of city .....        | N. C. & F. R. R. ....        | 793          |
| astle Pool .....                                                                 | Levels .....                 | 799          |
| Columbia .....                                                                   | C. & W. R. R. ....           | 477          |
| Cumberland .....                                                                 | N. C. R. R. ....             | 312          |
| Florence .....                                                                   | Pa. R. R. ....               | 1,076        |
| Freedom .....                                                                    | N. C. R. R. ....             | 827          |
| Galilee .....                                                                    | P., Ft. W. & C. R. R. ....   | 957          |
| Hamburg .....                                                                    | S. & A. R. R. ....           | 1,158        |
| Haven .....                                                                      | S. W. Pa. Extension .....    | 893          |
| irk .....                                                                        | S. Valley R. R. ....         | 912          |
| ilford .....                                                                     | Del., L. & W. R. R. ....     | 1,087        |
| Philadelphia .....                                                               | S. Valley R. R. ....         | 690          |
| ort .....                                                                        | Lehigh Valley R. R. ....     | 1,023        |
| o .....                                                                          | N. C. & B. V. R. R. ....     | 812          |
| o .....                                                                          | Pa. R. R. ....               | 395          |
| Providence Station .....                                                         | L. & Q. R. R. ....           | 401          |
| on .....                                                                         | D., A. V. & P. R. R. ....    | 1,411        |
| on Hamilton .....                                                                | Pa. R. R. ....               | 599          |
| on's Mills .....                                                                 | P. & P. R. R. ....           | 1,258        |
| own .....                                                                        | Phil. & N. R. R. ....        | 145          |
| ille .....                                                                       | Cumberland Valley R. R. .... | 533          |
| ork Junction .....                                                               | Phil. & R. R. R. ....        | 105          |
| own .....                                                                        | Phil. & R. R. R. ....        | 139          |
| lson .....                                                                       | Del., L. & W. R. R. ....     | 769          |
| r Hill .....                                                                     | N. Pa. R. R. ....            | 452          |
| Valley .....                                                                     | C., C. & A. R. R. ....       | 1,192        |
| eh .....                                                                         | Pa. R. R. ....               | 1,121        |
| o junction .....                                                                 | N. Y., L. E. & W. R. R. .... | 981          |
| 's .....                                                                         | U. & T. R. R. ....           | 1,298        |
| stown .....                                                                      | P., C. & St. L. R. R. ....   | 926          |
| stown .....                                                                      | Phil. & R. R. R. ....        | 75           |
| brook .....                                                                      | W. & R. R. R. ....           | 209          |
| East .....                                                                       | L. S. & M. S. R. R. ....     | 805          |
| Pa. R. R. junction .....                                                         | Lehigh Valley R. R. ....     | 237          |
| Point .....                                                                      | P. & E. R. R. ....           | 659          |
| umberland, intersection with Blooms-<br>burgh Division D., L. &<br>W. R. R. .... | S. & N. B. R. R. ....        | 452          |

| Station.                                                                       | Authority.           | Eleva |
|--------------------------------------------------------------------------------|----------------------|-------|
| Northumberland, junction of Del., L. & W. R. R                                 | P. & E. R. R         |       |
| Do ..... S. E. line of depot.                                                  | Del., L. & W. R. R   |       |
| North Warren                                                                   | D., A. V. & P. R. R  |       |
| North West                                                                     | W. Pa. R. R          |       |
| Oakdale                                                                        | B. & O. R. R         |       |
| Do                                                                             | P., C. & St. L. R. R |       |
| Oak Hill Station                                                               | Pa. R. R             |       |
| Oakland                                                                        | Chester Valley R. R  |       |
| Do                                                                             | Del., L. & W. R. R   |       |
| Oakley's                                                                       | Del., L. & W. R. R   |       |
| Oaks                                                                           | Perkiomen R. R       |       |
| O'Harra                                                                        | E. & C. R. R         |       |
| Ohio Pyle                                                                      | B. & O. R. R         |       |
| Oil City                                                                       | L. S. & M. S. R. R   |       |
| Do                                                                             | P., T. & B. R. R     |       |
| Do. Centre street crossing                                                     | P., T. & B. R. R     |       |
| Do. east, connects with A. V. R. R                                             | L. S. & M. S. R. R   |       |
| Do. connects with P., T. & B. R. R. & with Franklin Br. of the A. & G. W. R. R | L. S. & M. S. R. R   |       |
| Oleopolis                                                                      | L. S. & M. S. R. R   |       |
| Do                                                                             | P., T. & B. R. R     |       |
| Olyphant                                                                       | Pitohole Valley R. R |       |
| Ore Valley, B. M                                                               | L. R. R              |       |
| Osceola                                                                        | P. B. R. R           |       |
| Paintersville                                                                  | B. & O. R. R         |       |
| Palmyra                                                                        | S. W. Pa. R. R       |       |
| Paoli                                                                          | Lebanon Valley R. R  |       |
| Paoli Road                                                                     | Pa. R. R             |       |
| Paradise                                                                       | Chester Valley R. R  |       |
| Pardoe                                                                         | Del., L. & W. R. R   |       |
| Paris Road                                                                     | S. & A. R. R         |       |
| Parker Junction with A. V. R. R                                                | P., C. & St. L. R. R |       |
| Parker Station                                                                 | P. & K. C. R. R      |       |
| Parkesburgh                                                                    | A. V. R. R           |       |
| Parkton                                                                        | Pa. R. R             |       |
| Parnassus Station                                                              | N. C. R. R           |       |
| Parryville                                                                     | A. V. R. R           |       |
| Paschall                                                                       | L. & S. R. R         |       |
| Patton's                                                                       | P., W. & B. R. R     |       |
| Do. bench on top of parapet coping of arch culvert, W. side of road            | W. C. R. R           |       |
| Paxton                                                                         | Bennett's Br. R. R   |       |
| Peach Bottom                                                                   | Lebanon Valley R. R  |       |
| Do                                                                             | C. & P. D. R. R      |       |
| Pecopson                                                                       | P. B. R. R           |       |
| Pencord                                                                        | W. & R. R. R         |       |
| Pennsylvania House                                                             | Phil. & R. R. R      |       |
| Penlynn                                                                        | P., T. & B. R. R     |       |
| Pennfield                                                                      | N. Pa. R. R          |       |
| Penn Haven                                                                     | Bennett's Br. R. R   |       |
| Do ..... junction                                                              | L. & S. R. R         |       |
| Do ..... Do                                                                    | Lehigh Valley R. R   |       |
| Penningtonville                                                                | L. & S. R. R         |       |
| Penn Junction                                                                  | Pa. R. R             |       |
| Pennock's Summit                                                               | E. Pa. R. R          |       |
| Penn Station                                                                   | Pa. & Del. R.        |       |
| Do                                                                             | P. & B. C. R. R      |       |
| Pennsville                                                                     | Pa. R. R             |       |
| Penn Valley                                                                    | S. W. Pa. R. R       |       |
| Pequea Station                                                                 | Phil. & T. R. R      |       |
| Perkiomen Junction                                                             | L. & Q. R. R         |       |
| Perryville                                                                     | Phil. & R. R. R      |       |
|                                                                                | Pa. R. R             |       |

| Station.                                                                                                | Authority.                  | Elevation.   |
|---------------------------------------------------------------------------------------------------------|-----------------------------|--------------|
|                                                                                                         |                             | <i>Feet.</i> |
| Petersburgh.....                                                                                        | Pa. R. R.....               | 678          |
| Peter's Mills.....                                                                                      | L. & L. R. R.....           | 255          |
| Petroleum Centre.....                                                                                   | P., T. & B. R. R.....       | 1,089        |
| Petrolia.....                                                                                           | P. & K. C. R. R.....        | 1,175        |
| Philadelphia depot, 31st and Chestnut sts..                                                             | W., C. & P. R. R.....       | 14           |
| Do..... Market street.....                                                                              | Pa. R. R.....               | 32           |
| Do..... West Philadelphia.....                                                                          | Pa. R. R.....               | 34           |
| Do..... Fairmount bridge.....                                                                           | Pa. R. R.....               | 51           |
| Do..... Richmond street bridge.....                                                                     | Phil. & R. R. R.....        | 28           |
| Do..... Depot, cor. 9th and Green sts..                                                                 | Phil. & R. R. R.....        | 47           |
| Do..... Do..... at Willow street.....                                                                   | N. Pa. R. R.....            | 28           |
| Do..... Kensington, Frankford road<br>crossing.....                                                     | Phil. & T. R. R.....        | 32           |
| Do..... Frankford Station, middle of<br>Church street.....                                              | Phil. & T. R. R.....        | 32           |
| Do..... Bridesburgh, middle of Bridge<br>street.....                                                    | Phil. & T. R. R.....        | 32           |
| Do..... Tacouy.....                                                                                     | Phil. & T. R. R.....        | 34           |
| Do..... Southwark.....                                                                                  | P., W. & B. R. R.....       | 7            |
| Do..... 3d street.....                                                                                  | P., W. & B. R. R.....       | 27           |
| Do..... 6th street.....                                                                                 | P., W. & B. R. R.....       | 33           |
| Do..... 7th street.....                                                                                 | P., W. & B. R. R.....       | 34           |
| Do..... 10th street.....                                                                                | P., W. & B. R. R.....       | 32           |
| Do..... 12th street.....                                                                                | P., W. & B. R. R.....       | 27           |
| Do..... 18th street.....                                                                                | P., W. & B. R. R.....       | 36           |
| Do..... Signal Station.....                                                                             | U. S. Signal Office.....    | 52           |
| Philipsburgh.....                                                                                       | T. & C. R. R.....           | 1,425        |
| Do.....                                                                                                 | A. V. R. R.....             | 865          |
| Philson's.....                                                                                          | B. & O. R. R.....           | 1,820        |
| Phoenixville.....                                                                                       | Phil. & R. R. R.....        | 110          |
| Picture Rock.....                                                                                       | M. C. E. R.....             | 668          |
| Pikeland.....                                                                                           | Pickering Valley R. R.....  | 272          |
| Pine.....                                                                                               | P. & E. R. R.....           | 565          |
| Pine Creek.....                                                                                         | A. V. R. R.....             | 812          |
| Pinegrove.....                                                                                          | B. & O. R. R.....           | 1,874        |
| Pine Grove.....                                                                                         | L., C. & S. C. R. R.....    | 1,236        |
| Do.....                                                                                                 | S. & A. R. R.....           | 1,250        |
| Do.....                                                                                                 | N. Y., L. E. & W. R. R..... | 668          |
| Do..... Junction.....                                                                                   | S. & S. R. R.....           | 520          |
| Pine Hill.....                                                                                          | B. V. R. R.....             | 2,064        |
| Pinkerton.....                                                                                          | B. & O. R. R.....           | 1,649        |
| Pioneer.....                                                                                            | P., T. & B. R. R.....       | 1,099        |
| Piper's Run.....                                                                                        | H. & B. T. R. R.....        | 947          |
| Pithole City.....                                                                                       | Pithole Valley R. R.....    | 1,309        |
| Pittsburgh.. Union Depot.....                                                                           | P., Ft. W. & C. R. R.....   | 745          |
| Do..... on window-sill of Monongahela<br>Incline Plane, Check House..                                   | City levels.....            | 1,106        |
| Do..... on Belt course of Union Depot,<br>main entrance.....                                            | City levels.....            | 746          |
| Do..... on East end door-sill of Point<br>Breeze Hotel, at intersection<br>of Penn. and Fifth avenues.. | City levels.....            | 973          |
| Do..... on Belt course of Munshall's dis-<br>tillery, corner Penn. ave. and<br>Water street.....        | City levels.....            | 727          |
| Do..... on door-sill of post-office.....                                                                | City levels.....            | 751          |
| Pittsburgh, on embankment of Lower (old)<br>Reservoir, on Bedford ave.....                              | City levels.....            | 865          |
| Do..... on embankment of Upper (old)<br>Reservoir, Bedford ave.....                                     | City levels.....            | 1,101        |
| Do..... on flow-line of Highland ave.<br>(new) Reservoir.....                                           | City levels.....            | 1,064        |
| Do..... on flow-line of Herron Hill (new)<br>Reservoir.....                                             | City Levels.....            | 1,259        |



| Station.                                                                                                    | Authority.                   | Elevation.   |
|-------------------------------------------------------------------------------------------------------------|------------------------------|--------------|
|                                                                                                             |                              | <i>Feet.</i> |
| Pittsburgh on flow-line of Brilliant Hill (new) Reservoir.....                                              | City levels .....            | 934          |
| Do.... B. M. on outer corner of coping, near Twenty-sixth street .....                                      | A. V. R. R. ....             | 745          |
| Do.... Liberty avenue crossing .....                                                                        | A. V. R. R. ....             | 743          |
| Do.... B. M. on south wall, upper outside corner, culvert .....                                             | A. V. R. R. ....             | 728          |
| Do.... junction with P. C. & St. L. R. R. ....                                                              | P., V. & C. R. R. ....       | 776          |
| Do.... opposite Forty-third st. station .....                                                               | P., V. & C. R. R. ....       | 739          |
| Do.... crossing of Fiftieth street.....                                                                     | P., V. & C. R. R. ....       | 739          |
| Do.... low water, city datum .....                                                                          | Levels .....                 | 699          |
| Do.... high water, 1852 .....                                                                               | Levels .....                 | 730          |
| Do.... high water, 1832 .....                                                                               | Levels .....                 | 733          |
| Do.... east side of Irwin street.....                                                                       | Penn. R. R. ....             | 737          |
| Do.... east side of Duquesne street.....                                                                    | Penn. R. R. ....             | 739          |
| Do.... B. M. at foot of lamp-post, south side of Liberty street, intersection with Water street.....        | Penn. R. R. ....             | 721          |
| Do.... B. M. on south side of base ring of fire-plug, north side of Penn. st. intersec. with Water st ..... | Penn. R. R. ....             | 726          |
| Do.... Signal Station .....                                                                                 | U. S. Signal Office.....     | 762          |
| Pittsfield .....                                                                                            | D., A. V. & P. R. R. ....    | 1,245        |
| Pittston .....                                                                                              | Del., L. & W. R. R. ....     | 572          |
| Do.... west end bridge, crossing Susquehanna .....                                                          |                              | 571          |
| Plainsville .....                                                                                           | Lehigh Valley R. R. ....     | 546          |
| Pleasant Grove.....                                                                                         | H. & B. T. R. R. ....        | 748          |
| Pleasantville.....                                                                                          | Pithole Valley R. R. ....    | 1,634        |
| Plymouth .....                                                                                              | Del., L. & W. R. R. ....     | 535          |
| Do.... Junction .....                                                                                       | Del., L. & W. R. R. ....     | 543          |
| Point Lookout.....                                                                                          | B. G. R. R. ....             | 1,915        |
| Polk .....                                                                                                  | L. S. & M. S. R. R. ....     | 1,084        |
| Pomeroy, E. intersec. of P. & D. R. R. ....                                                                 | Pa. R. R. ....               | 483          |
| Do.... W. intersec. of P. & D. R. R. ....                                                                   | Pa. R. R. ....               | 469          |
| Pond Eddy.....                                                                                              | N. Y., L. E. & W. R. R. .... | 570          |
| Portage .....                                                                                               | Pa. R. R. ....               | 1,675        |
| Port Allegheny .....                                                                                        | B., N. Y., & P. R. R. ....   | 1,482        |
| Port Carbon .....                                                                                           | S. Valley R. R. ....         | 639          |
| Do....                                                                                                      | M. C. R. R. ....             | 634          |
| Port Clinton.....                                                                                           | Del. & Hudson Canal.....     | 455          |
| Do....                                                                                                      | Phil. & R. R. R. ....        | 410          |
| Port Jervis.....                                                                                            | Del. & Hudson Canal.....     | 455          |
| Port Kennedy.....                                                                                           | Phil. & R. R. R. ....        | 87           |
| Portland .....                                                                                              | Del., L. & W. R. R. ....     | 291          |
| Port Matilda, Main st.....                                                                                  | B. E. Valley R. R. ....      | 1,007        |
| Port Perry Junction .....                                                                                   | B. & O. R. R. ....           | 765          |
| Port Royal.....                                                                                             | B. & O. R. R. ....           | 722          |
| Port Trevorton, R. R. track.....                                                                            | S. & N. B. R. R. ....        | 428          |
| Potts Colliery .....                                                                                        | N. H. & S. H. R. R. ....     | 1,094        |
| Pottsgrove .....                                                                                            | C. & W. R. R. ....           | 499          |
| Pott's Landing.....                                                                                         | Phil. & R. R. R. ....        | 63           |
| Pottstown .....                                                                                             | Phil. & R. R. R. ....        | 150          |
| Pottsville.....                                                                                             | Phil. & R. R. R. ....        | 614          |
| Powelton .....                                                                                              | T. C. R. R. ....             | 1,798        |
| Pulaski .....                                                                                               | E. & P. R. R. ....           | 826          |
| Prather .....                                                                                               | Pithole Valley R. R. ....    | 1,251        |
| Prescott .....                                                                                              | Lebanon Valley R. R. ....    | 501          |
| President .....                                                                                             | P., T. & B. R. R. ....       | 1,048        |
| Primrose .....                                                                                              | P., C. & St. L. R. R. ....   | 1,021        |
| Princeton .....                                                                                             | P. & R. R. R. ....           | 62           |
| Prindibles .....                                                                                            | Bennett's Br. R. R. ....     | 1,360        |
| Providence.....                                                                                             | L. R. R. ....                | 703          |
| Quakake Station.....                                                                                        | C. & W. R. R. ....           | 1,353        |
| Quakertown.....                                                                                             | N. C. & B. V. R. R. ....     | 817          |

| Station.                                                       | Authority.                 | Elevation.   |
|----------------------------------------------------------------|----------------------------|--------------|
|                                                                |                            | <i>Feet.</i> |
| <b>Quakertown</b> .....                                        | N. Pa. R. R. ....          | 496          |
| <b>Quarryville</b> .....                                       | L. & Q. R. R. ....         | 488          |
| <b>Queens Run</b> .....                                        | P. & E. R. R. ....         | 584          |
| <b>Radebaughs Station</b> .....                                | Pa. R. R. ....             | 1,150        |
| <b>Radnor</b> .....                                            | Pa. R. R. ....             | 409          |
| <b>Rahn's</b> .....                                            | Perkiomen R. R. ....       | 138          |
| <b>Ralston</b> .....                                           | N. C. R. R. ....           | 860          |
| <b>Ransom</b> .....                                            | Lehigh Valley R. R. ....   | 579          |
| <b>Rarigs Station</b> .....                                    | C. & W. R. R. ....         | 1,340        |
| <b>Rathbon</b> .....                                           | P. & E. R. R. ....         | 1,317        |
| <b>Rattling Run</b> .....                                      | S. & S. R. R. ....         | 692          |
| <b>Raymilton</b> .....                                         | L. S. & M. S. R. R. ....   | 1,138        |
| <b>Reading</b> .....                                           | Phil. & R. R. R. ....      | 268          |
| Do. B. M. on coping stone easternmost<br>R. R. bridge .....    | U. S. C. & G. S. ....      | 264          |
| <b>Red Bank Junction</b> .....                                 | Bennett's Br. R. R. ....   | 851          |
| <b>Redington</b> .....                                         | Lehigh Valley R. R. ....   | 211          |
| <b>Red Lion</b> .....                                          | C. & F. R. R. ....         | 793          |
| Do .....                                                       | P. B. R. R. ....           | 900          |
| <b>Reed's Road</b> .....                                       | E., B. & W. R. R. ....     | 309          |
| <b>Reedsville</b> .....                                        | M. & C. Co. R. R. ....     | 593          |
| <b>Reese Station</b> .....                                     | Pa. R. R. ....             | 903          |
| <b>Reeseville</b> .....                                        | Pa. R. R. ....             | 495          |
| <b>Reimerton</b> .....                                         | A. V. R. R. ....           | 837          |
| <b>Reinhold's</b> .....                                        | R. & C. R. R. ....         | 449          |
| <b>Reiter</b> .....                                            | L. & L. R. R. ....         | 299          |
| <b>Remington</b> .....                                         | P., Ft. W. & C. R. R. .... | 710          |
| <b>Reno</b> .....                                              | A. & G. W. R. R. ....      | 1,011        |
| Do .....                                                       | L. S. & M. S. R. R. ....   | 1,018        |
| <b>Renovo</b> .....                                            | P. & E. R. R. ....         | 672          |
| <b>Reynolds</b> .....                                          | L. Schuyl. R. R. ....      | 663          |
| <b>Reynoldsville, at crossing of Brookville<br/>pike</b> ..... | Bennett's Br. R. R. ....   | 1,377        |
| <b>Rheems</b> .....                                            | Pa. R. R. ....             | 439          |
| <b>Riceville</b> .....                                         | U. & T. R. R. ....         | 1,369        |
| <b>Richfield</b> .....                                         | S. & N. R. R. ....         | 765          |
| <b>Richland</b> .....                                          | Lebanon Valley R. R. ....  | 491          |
| <b>Riddlesburgh</b> .....                                      | H. & B. T. R. R. ....      | 865          |
| <b>Ridgeway</b> .....                                          | P. & E. R. R. ....         | 1,393        |
| Do .....                                                       | N. Y., R. & P. R. R. ....  | 1,376        |
| <b>Ridley Park</b> .....                                       | P., W. & B. R. R. ....     | 73           |
| <b>Rine's Store</b> .....                                      | S. & N. R. R. ....         | 412          |
| <b>Ringgold</b> .....                                          | L. Schuyl. R. R. ....      | 558          |
| <b>Ringtown</b> .....                                          | C. & W. R. R. ....         | 1,130        |
| <b>Ritchie</b> .....                                           | P. & E. R. R. ....         | 632          |
| <b>Rittenhouse Gap</b> .....                                   | C. & F. R. R. ....         | 940          |
| <b>Riverton</b> .....                                          | B. & O. R. R. ....         | 765          |
| <b>Roaring Run</b> .....                                       | T. & C. R. R. ....         | 1,427        |
| Do .....                                                       | W. Pa. R. R. ....          | 830          |
| <b>Roaring Spring Junction</b> .....                           | Pa. R. R. ....             | 1,196        |
| <b>Robbin's</b> .....                                          | B. & O. R. R. ....         | 768          |
| <b>Roberts'</b> .....                                          | S. & M. P. R. R. ....      | 2,042        |
| <b>Robertdale</b> .....                                        | E. Broadtop R. R. ....     | 1,785        |
| <b>Robesonia</b> .....                                         | Lebanon Valley R. R. ....  | 441          |
| <b>Rochester</b> .....                                         | Cleve. & P. R. R. ....     | 711          |
| Do... junction with C. & P. R. R. ....                         | P., Ft. W. & C. R. R. .... | 706          |
| <b>Rock Glen</b> .....                                         | D., H. & W. R. R. ....     | 921          |
| <b>Rockhill</b> .....                                          | E. Broadtop R. R. ....     | 624          |
| <b>Rockland Station</b> .....                                  | A. V. R. R. ....           | 926          |
| <b>Rockport</b> .....                                          | Lehigh Valley R. R. ....   | 906          |
| Do .....                                                       | L. & S. R. R. ....         | 882          |
| <b>Rockville</b> .....                                         | S. & S. R. R. ....         | 349          |
| <b>Rockwood</b> .....                                          | P., T. & B. R. R. ....     | 1,016        |
| <b>Roherstown</b> .....                                        | Pa. R. R. ....             | 352          |

| Station.                            | Authority.                    | Elev. |
|-------------------------------------|-------------------------------|-------|
| Romain .....                        | S. R. R .....                 |       |
| Roots .....                         | B. G. R. R .....              |       |
| Rosedale .....                      | P. & B. C. R. R .....         |       |
| Rosemont .....                      | Pa. R. R .....                |       |
| Ross .....                          | W. Pa. R. R .....             |       |
| Roston Station .....                | A. V. R. R .....              |       |
| Rough and Ready .....               | H. & B. T. R. R .....         |       |
| Roulette .....                      | J. S., P. C., & B. R. R ..... |       |
| Round Island .....                  | P. & E. R. R .....            |       |
| Roups Station .....                 | Pa. R. R .....                |       |
| Rouseville .....                    | P., T. & B. R. R .....        |       |
| Rowlands .....                      | N. Y., L. E. & W. R. R .....  |       |
| Royer's Ford .....                  | Phil. & R. R. R .....         |       |
| Roy Stone .....                     | P. & E. R. R .....            |       |
| Run .....                           | L. S. & M. S. R. R .....      |       |
| Runmerfield .....                   | Lehigh Valley R. R. .....     |       |
| Rupert .....                        | C. & W. R. R .....            |       |
| Do .....                            | Del., L. & W. R. R .....      |       |
| Russelburg .....                    | D., A. V. & P. R. R .....     |       |
| Rutherford's .....                  | Lebanon Valley R. R .....     |       |
| Rynd Farm .....                     | P., T. & B. R. R .....        |       |
| Saegerstown .....                   | A. & G. W. R. R .....         |       |
| Safe Harbor .....                   | C. & P. D. R. R .....         |       |
| St. Clair .....                     | M. C. R. R .....              |       |
| Do .....                            | Pa. R. R .....                |       |
| St. George Station .....            | A. V. R. R .....              |       |
| St. Mary's .....                    | P. & E. R. R .....            |       |
| Salem .....                         | L. S. & M. S. R. R .....      |       |
| Salina .....                        | W. Pa. R. R .....             |       |
| Salisbury .....                     | S. R. R .....                 |       |
| Saltillo .....                      | E. Broadtop R. R .....        |       |
| Saltsburgh .....                    | B. & O. R. R .....            |       |
| Salt Works .....                    | B. & O. R. R .....            |       |
| Saltsburgh, Market street .....     | W. Pa. R. R .....             |       |
| Salunga .....                       | Pa. R. R .....                |       |
| Sanders .....                       | E. & C. R. R .....            |       |
| Sandpatch Tunnel, west portal ..... | B. & O. R. R .....            |       |
| Do .....                            | B. & O. R. R .....            |       |
| Do .....                            | B. & O. R. R .....            |       |
| Sand Works .....                    | B. & O. R. R .....            |       |
| Sandy Creek Station .....           | A. V. R. R .....              |       |
| Sandy Lake .....                    | L. S. & M. S. R. R .....      |       |
| Sandy Lick Station .....            | W. Pa. R. R .....             |       |
| Sandy Ridge .....                   | T. & C. R. R .....            |       |
| Sandy Run Junction .....            | L. & S. R. R .....            |       |
| Sang Hollow .....                   | Pa. R. R .....                |       |
| Sanner's .....                      | S. & M. P. R. R .....         |       |
| Sarah Furnace Station .....         | A. V. R. R .....              |       |
| Sartwell .....                      | B., N. Y. & P. R. R .....     |       |
| Sarver's Station .....              | W. Pa. R. R .....             |       |
| Saxonburg Station .....             | W. Pa. R. R .....             |       |
| Saxton (new depot) .....            | H. & B. T. R. R .....         |       |
| Sayre .....                         | Lehigh Valley R. R .....      |       |
| Scahonda .....                      | P. & E. R. R .....            |       |
| School Lane .....                   | Phila. & R. R. R .....        |       |
| Schur's .....                       | Phila. & R. R. R .....        |       |
| Schuylkill Bridge .....             | Lebanon Valley R. R .....     |       |
| Schuylkill Haven .....              | Phila. & R. R. R .....        |       |
| Schwenkville .....                  | Perkiomen R. R .....          |       |
| Scotch Valley .....                 | D., H. & W. R. R .....        |       |
| Scottdale .....                     | S. W. Pa. R. R .....          |       |
| Scottsville .....                   | E. Broadtop R. R .....        |       |
| Scranton, Union Depot .....         | Del., L. & W. R. R .....      |       |
| Do .....                            | Hyde Park .....               |       |
| Do .....                            | Cliff street .....            |       |
| Do .....                            | Green Ridge .....             |       |

| Station.                                                                      | Authority.                     | Elevation.   |
|-------------------------------------------------------------------------------|--------------------------------|--------------|
|                                                                               |                                | <i>Feet.</i> |
| Scranton, Prov. street .....                                                  | City Engineer .....            | 771          |
| Scrubgrass Station .....                                                      | A. V. R. R. ....               | 945          |
| Seager's .....                                                                | C. & W. R. R. ....             | 512          |
| Sedgwick .....                                                                | B. & O. R. R. ....             | 868          |
| Seeds .....                                                                   | W. & R. R. R. ....             | 195          |
| Seityland .....                                                               | N. C. R. R. ....               | 611          |
| Selinsgrove, frog at junct'n with N. C. R. R. ....                            | Sunbury & Lewistown R. R. .... | 438          |
| Do..... crossing Susquehanna River ..                                         | Sunbury & Lewistown R. R. .... | 439          |
| Do..... west end of R. R. bridge ..                                           | Sunbury & Lewistown R. R. .... | 439          |
| Do..... Station .....                                                         | Sunbury & Lewistown R. R. .... | 440          |
| Do..... S. line station-house ..                                              | N. C. R. R. ....               | 438          |
| Do..... junction .....                                                        | N. C. R. R. ....               | 438          |
| Do..... center of Pine street .....                                           | S. & N. B. R. R. ....          | 441          |
| Sellers .....                                                                 | R. & C. R. R. ....             | 382          |
| Sellersville .....                                                            | N. Pa. R. R. ....              | 331          |
| Sewickley .....                                                               | P., Ft. W. & C. R. R. ....     | 736          |
| Do..... Station .....                                                         | Yough. R. R. ....              | 780          |
| Do..... Y. Branch of Pennsylvania R. R. ....                                  | B. & O. R. R. ....             | 779          |
| Seymour .....                                                                 | N. C. & B. V. R. R. ....       | 797          |
| Shadyside Station .....                                                       | Pa. R. R. ....                 | 856          |
| Shaeffer's .....                                                              | Bennett Branch R. R. ....      | 1,425        |
| Shaffer .....                                                                 | P., T. & B. R. R. ....         | 1,133        |
| Shafton Station .....                                                         | Pa. R. R. ....                 | 905          |
| Shainlines .....                                                              | Chester Valley R. R. ....      | 136          |
| Shamokin .....                                                                | N. C. R. R. ....               | 738          |
| Shamrock .....                                                                | E. Pa. R. R. ....              | 433          |
| Shanghai Station .....                                                        | Pa. R. R. ....                 | 1,173        |
| Sharon .....                                                                  | A. & G. W. R. R. ....          | 859          |
| Sharon Hill .....                                                             | P., W. & B. R. R. ....         | 65           |
| Sharpsburgh, Main street .....                                                | W. Pa. R. R. ....              | 739          |
| Sharpsburgh Station .....                                                     | A. V. R. R. ....               | 745          |
| Sharpsville .....                                                             | E. & P. R. R. ....             | 948          |
| Shawmont .....                                                                | Phil. & R. R. R. ....          | 69           |
| Shawmut .....                                                                 | P. & E. R. R. ....             | 1,427        |
| Shaw's Landing .....                                                          | A. & G. W. R. R. ....          | 1,092        |
| Shaw's Run .....                                                              | T. & C. R. R. ....             | 1,112        |
| Sheffield .....                                                               | P. & E. R. R. ....             | 1,337        |
| Shelmires .....                                                               | E. B. & W. R. R. ....          | 246          |
| Shenandoah, City Depot .....                                                  | M. & S. R. R. ....             | 1,252        |
| Shenango .....                                                                | E. & P. R. R. ....             | 941          |
| Do... Grade crossing S. & A. R. R. ....                                       | A. & G. W. R. R. ....          | 936          |
| Shenk's Ferry .....                                                           | C. & P. D. R. R. ....          | 183          |
| Sheridan .....                                                                | Lebanon Valley R. R. ....      | 459          |
| Do .....                                                                      | P., C. & St. L. R. R. ....     | 846          |
| Shickshing .....                                                              | Del., L. & W. R. R. ....       | 521          |
| Shimer's .....                                                                | L. & L. R. R. ....             | 289          |
| Shimmels .....                                                                | T. & C. R. R. ....             | 1,641        |
| Ship Bridge .....                                                             | Pa. R. R. ....                 | 411          |
| Shippen .....                                                                 | B., N. Y. & P. R. R. ....      | 1,206        |
| Shippensburg .....                                                            | Cumberland Valley R. R. ....   | 654          |
| Shippensburg, B. M. on water table, N.<br>W. corner Main & Railroad sts ..... | U. S. C. & G. S. ....          | 653          |
| Shirleysburgh .....                                                           | E. Broadtop R. R. ....         | 572          |
| Shock's Mill .....                                                            | Pa. R. R. ....                 | 269          |
| Shoemakersville .....                                                         | Phil. & R. R. R. ....          | 314          |
| Shohola .....                                                                 | N. Y., L. E. & W. R. R. ....   | 648          |
| Shoo-Fly Tunnel .....                                                         | B. & O. R. R. ....             | 1,621        |
| Shugart's .....                                                               | L. C. & S. C. R. R. ....       | 1,131        |
| Shuman's Bridge, bench-mark on W. end..                                       | Pa. R. R. ....                 | 699          |
| Shuman's Tunnel .....                                                         | C. & W. R. R. ....             | 803          |
| Sinking Springs .....                                                         | R. & C. R. R. ....             | 348          |
| Sinnemahoning .....                                                           | P. & E. R. R. ....             | 794          |
| Sippack .....                                                                 | Perkiomen R. R. ....           | 145          |
| Slab Run .....                                                                | Bennett's Br. R. R. ....       | 1,405        |



| Station.                             | Authority.                  | Elevation.   |
|--------------------------------------|-----------------------------|--------------|
|                                      |                             | <i>Fect.</i> |
| Stoneham.....                        | P. & E. R. R.....           | 1,347        |
| Stone House.....                     | P. & K. C. R. R.....        | 1,089        |
| Street Road.....                     | W. C. & P. R. R.....        | 252          |
| Stroudsburgh.....                    | Del., L. & W. R. R.....     | 403          |
| Sugar Creek.....                     | A. & G. W. R. R.....        | 1,014        |
| Sugar Grove.....                     | A. & G. W. R. R.....        | 1,040        |
| Sugar Notch.....                     | Lehigh Valley R. R.....     | 666          |
| Do.....                              | L. & S. R. R.....           | 660          |
| Sullivan.....                        | P., Ft. W. & C. R. R.....   | 765          |
| Summerhill.....                      | Pa. R. R.....               | 1,557        |
| Sunbury.....                         | N. C. R. R.....             | 444          |
| Do..junction with Shamokin Branch    |                             |              |
| N. C. R. R.....                      | N. C. R. R.....             | 441          |
| Do..north line of depot building     | N. C. R. R.....             | 444          |
| Do..junction with D. W. & H. R. R... | N. C. R. R.....             | 451          |
| Do..Junction.....                    | D., H. & W. R. R.....       | 443          |
| Do..junction of Shamokin Branch of   |                             |              |
| N. C. R. R.....                      | P. & E. R. R.....           | 444          |
| Susquehanna.....                     | N. Y., L. E. & W. R. R..... | 914          |
| Do.....                              | P. & E. R. R.....           | 534          |
| Do.....                              | Pa. R. R.....               | 342          |
| Susquehanna Bridge.....              | Pa. R. R.....               | 350          |
| Susquehanna Junction.....            | N. Y., L. E. & W. R. R..... | 962          |
| Swanville.....                       | E. & P. R. R.....           | 735          |
| Swarthmore.....                      | W. C. & P. R. R.....        | 125          |
| Swatara Gap.....                     | L. & T. R. R.....           | 447          |
| Swede Furnace.....                   | Phil. & R. R. R.....        | 66           |
| Swiss Vale Station.....              | Pa. R. R.....               | 922          |
| Tamaqua.....                         | C. & W. R. R.....           | 804          |
| Do.....                              | T. B. R. R.....             | 787          |
| Tameness.....                        | N. Valley R. R.....         | 1,287        |
| Tarentum.....                        | W. Pa. R. R.....            | 757          |
| Do.....                              | A. V. R. R.....             | 778          |
| Tarr Farm.....                       | P., T. & B. R. R.....       | 1,062        |
| Tatesville.....                      | H. & B. T. R. R.....        | 1,096        |
| Taylorville.....                     | B. & O. R. R.....           | 1,008        |
| Taylorville.....                     | Del., L. & W. R. R.....     | 683          |
| Teepie Town.....                     | P. & P. R. R.....           | 1,204        |
| Temperanceville.....                 | P., C. & St. L. R. R.....   | 767          |
| Temple.....                          | E. Pa. R. R.....            | 387          |
| Templeton Station.....               | A. V. R. R.....             | 824          |
| Thompson.....                        | N. Y., L. E. & W. R. R..... | 1,703        |
| Do.....                              | P., V. & C. R. R.....       | 765          |
| Thompson's.....                      | N. C. B. V. R. R.....       | 860          |
| Do.....                              | P., T. & B. R. R.....       | 1,143        |
| Thompson's Mills.....                | B. & O. R. R.....           | 1,108        |
| Thompsontown.....                    | Pa. R. R.....               | 419          |
| Thorndale.....                       | Pa. R. R.....               | 313          |
| Thurlow.....                         | P., W. & B. R. R.....       | 34           |
| Idioute.....                         | P., T. & B. R. R.....       | 1,112        |
| Imonium.....                         | N. C. R. R.....             | 395          |
| Ioiga.....                           | Phila. & R. R. R.....       | 129          |
| Do.....                              | S. C. R. R.....             | 896          |
| Do.....                              | Tioga R. R.....             | 1,042        |
| Ioiga Junction.....                  | T. & E. & S. L. R. R.....   | 1,021        |
| Ioiga Village.....                   | C., C. & A. R. R.....       | 1,052        |
| Ioiga.....                           | P. & E. R. R.....           | 1,359        |
| Ionesta.....                         | P., T. & B. R. R.....       | 1,060        |
| Ipton.....                           | Pa. R. R.....               | 990          |
| Iusville.....                        | P., T. & B. R. R.....       | 1,194        |
| Do.....                              | Pithole Valley R. R.....    | 1,181        |
| Do..Franklin street crossing.....    | P., T. & B. R. R.....       | 1,194        |
| Do..Washington street crossing.....  | P., T. & B. R. R.....       | 1,194        |
| Do..Monroe street crossing.....      | P., T. & B. R. R.....       | 1,195        |

| Station.                                                                | Authority.                   | Elevation.   |
|-------------------------------------------------------------------------|------------------------------|--------------|
|                                                                         |                              | <i>Feet.</i> |
| Tivola .....                                                            | M. C. R. R. ....             | 708          |
| Tobyhanna .....                                                         | Del., L. & W. R. R. ....     | 1,932        |
| Tombicken .....                                                         | D., H. & W. R. R. ....       | 1,228        |
| Ton Road .....                                                          | W. C. R. R. ....             | 577          |
| Topton Junction .....                                                   | E. Pa. R. R. ....            | 485          |
| Torren's Station .....                                                  | Pa. R. R. ....               | 920          |
| Toughkenamon .....                                                      | P. & B. C. R. R. ....        | 283          |
| Towanda .....                                                           | Lehigh Valley R. R. ....     | 738          |
| Do...switch at upper depot .....                                        | B. R. R. ....                | 738          |
| Do...Barclay depot .....                                                | B. R. R. ....                | 725          |
| Transfer .....                                                          | A. & G. W. R. R. ....        | 993          |
| Treichler's .....                                                       | L. & S. R. R. ....           | 344          |
| Tremont .....                                                           | L. & T. R. R. ....           | 766          |
| Trevorton Junction .....                                                | N. C. R. R. ....             | 428          |
| Trexlerstown .....                                                      | C. & F. R. R. ....           | 411          |
| Trowbridge .....                                                        | T. & E. & S. L. R. R. ....   | 1,440        |
| Troy .....                                                              | Bennett's Br. R. R. ....     | 1,186        |
| Do .....                                                                | N. C. R. R. ....             | 1,148        |
| Trunkkeyville .....                                                     | P., T. & B. R. R. ....       | 1,098        |
| Tryonville .....                                                        | P., T. & B. R. R. ....       | 1,318        |
| Tryonville Junction .....                                               | U. & T. R. R. ....           | 1,320        |
| Tuckerton .....                                                         | Phila. & R. R. R. ....       | 298          |
| Tullytown .....                                                         | Phila. & T. R. R. ....       | 20           |
| Tunkhannock .....                                                       | Lehigh Valley R. R. ....     | 611          |
| Tunkhannock, Junction with L. V. R. R. ....                             | M. R. R. ....                | 611          |
| Turner .....                                                            | L. S. & M. S. R. R. ....     | 1,060        |
| Turner's .....                                                          | N. C. & F. R. R. ....        | 1,137        |
| Turtle Creek Station .....                                              | Pa. R. R. ....               | 750          |
| Tuscarora .....                                                         | Schuylkill Valley R. R. .... | 909          |
| Do .....                                                                | Pa. R. R. ....               | 429          |
| Do...B. M. on top of stone foundation<br>W. corner of water station.... | Pa. R. R. ....               | 424          |
| Tuscarora Mountain .....                                                | Levels .....                 | 1,926        |
| Tussey's Mountain .....                                                 | Levels .....                 | 1,964        |
| Tyler's Station .....                                                   | Bennett's Br. R. R. ....     | 1,232        |
| Tylersville .....                                                       | M. R. R. ....                | 1,400        |
| Tyrone .....                                                            | L., C. & S. C. R. R. ....    | 907          |
| Tyrone Water Station .....                                              | Pa. R. R. ....               | 896          |
| Ulster .....                                                            | Lehigh Valley R. R. ....     | 743          |
| Union .....                                                             | P. & E. R. R. ....           | 1,270        |
| Do .....                                                                | R. & C. R. R. ....           | 389          |
| Union City .....                                                        | A. & G. W. R. R. ....        | 1,301        |
| Do...P. & E. Junction .....                                             | U. & T. R. R. ....           | 1,270        |
| Uniondale .....                                                         | N. Y., L. E. & W. R. R. .... | 1,670        |
| Union Forge .....                                                       | L. & T. R. R. ....           | 432          |
| Union Furnace .....                                                     | Pa. R. R. ....               | 799          |
| Uniontown .....                                                         | Cumberland T'p'k .....       | 952          |
| Do .....                                                                | P. & C. R. R. ....           | 961          |
| Do .....                                                                | S. W. Pa. Extension .....    | 990          |
| Unionville .....                                                        | P. & E. Valley R. R. ....    | 782          |
| Upper Catawasqua .....                                                  | L. & S. R. R. ....           | 264          |
| Upper Lehigh .....                                                      | L. & S. R. R. ....           | 1,802        |
| Upton .....                                                             | Pa. R. R. ....               | 430          |
| Ursina .....                                                            | U. & N. F. R. R. ....        | 1,342        |
| Ursina Junction, U. & N. F. R. R. Junc. ....                            | B. & O. R. R. ....           | 1,406        |
| Utica .....                                                             | A. & G. W. R. R. ....        | 1,036        |
| Valley Coal Mines .....                                                 | P. & C. R. R. ....           | 1,035        |
| Valley Forge .....                                                      | Phil. & R. R. R. ....        | 98           |
| Valley Store .....                                                      | Chester Valley R. R. ....    | 285          |
| Valley Works .....                                                      | S. W. Pa. R. R. ....         | 1,075        |
| Van Emman's .....                                                       | Chartiers R. R. ....         | 922          |
| Vanscoyoc .....                                                         | B. G. R. R. ....             | 1,925        |
| Do .....                                                                | T. & C. R. R. ....           | 1,427        |
| Venango .....                                                           | A. & G. W. R. R. ....        | 1,163        |
| Verona Station .....                                                    | A. V. R. R. ....             | 746          |

| Station.                                 | Authority.                  | Elevation.   |
|------------------------------------------|-----------------------------|--------------|
|                                          |                             | <i>Feet.</i> |
| argh.....                                | L., C. & S. C. R. R.....    | 529          |
| ova.....                                 | Pa. R. R.....               | 430          |
| d.....                                   | Pa. R. R.....               | 548          |
| h.....                                   | N. C. & F. R. R.....        | 1,025        |
| .....                                    | Lehigh Valley R. R.....     | 615          |
| .....                                    | C. & F. R. R.....           | 550          |
| s Mill.....                              | P., C. & St. L. R. R.....   | 833          |
| own.....                                 | Pa. R. R.....               | 388          |
| Run.....                                 | P., Ft. W. & C. R. R.....   | 895          |
| town.....                                | T. & C. R. R.....           | 1,727        |
| ford.....                                | W. C. & P. R. R.....        | 108          |
| tation.....                              | Pa. R. R.....               | 751          |
| Bend.....                                | P., T. & B. R. R.....       | 1,023        |
| Port.....                                | L. & S. R. R.....           | 371          |
| m.....                                   | N. C. & B. V. R. R.....     | 801          |
| ie.....                                  | L. & S. R. R.....           | 644          |
| .....                                    | D., A. V. & P. R. R.....    | 1,200        |
| .....                                    | P. & E. R. R.....           | 1,186        |
| Ridge.....                               | Pa. R. R.....               | 677          |
| Run.....                                 | Lehigh Valley R. R.....     | 716          |
| gton.....                                | C. & P. D. R. R.....        | 232          |
| .....                                    | Chartiers R. R.....         | 1,031        |
| .....                                    | B. & O. R. R.....           | 1,049        |
| .....                                    | Cumberland T'p'k.....       | 1,406        |
| rd.....                                  | Levels.....                 | 630          |
| .....                                    | P. & E. R. R.....           | 1,193        |
| vile (surf. of Little Pine Cr.).....     | J. S., P. C. & B. R. R..... | 614          |
| town.....                                | P. & E. R. R.....           | 481          |
| .....                                    | P. & C. R. R.....           | 991          |
| .....                                    | Lehigh Valley R. R.....     | 830          |
| 7 Junction.....                          | Lehigh Valley R. R.....     | 824          |
| .....                                    | Pa. R. R.....               | 405          |
| .....                                    | Phil. & R. R. R.....        | 156          |
| .....                                    | P. & E. R. R.....           | 572          |
| burgh Station.....                       | E., B. & W. R. R.....       | 723          |
| 's Mill.....                             | N. Y., L. E. & W. R. R..... | 1,290        |
| rt.....                                  | L. & S. R. R.....           | 475          |
| .....                                    | T. & E. & S. L. R. R.....   | 995          |
| rough.....                               | C., C. & A. R. R.....       | 1,319        |
| 's Station.....                          | S. & N. B. R. R.....        | 418          |
| vile.....                                | Lebanon Valley R. R.....    | 383          |
| y.....                                   | McK. & B. R. R.....         | 1,461        |
| vile.....                                | L. S. & M. S. R. R.....     | 697          |
| lexandria.....                           | B. & O. R. R.....           | 1,043        |
| .....                                    | Cumberland Turnpike.....    | 1,797        |
| brownsville, in street in front of.....  | P. V. & C. R. R.....        | 774          |
| hester.....                              | W. C. & P. R. R.....        | 406          |
| ..... Gay street.....                    | W. C. R. R.....             | 420          |
| ..... Market street.....                 | W. C. R. R.....             | 414          |
| ..... junction with W. C. & P. R. R..... | P. & B. C. R. R.....        | 133          |
| onahohocken.....                         | Phil. & R. R. R.....        | 61           |
| alls.....                                | Phil. & R. R. R.....        | 61           |
| rove.....                                | P. & B. C. R. R.....        | 444          |
| anayunk.....                             | Phil. & R. R. R.....        | 61           |
| awton.....                               | B. & O. R. R.....           | 782          |
| verton.....                              | P. & C. R. R.....           | 1,045        |
| ittston.....                             | Del., L. & W. R. R.....     | 579          |
| rt.....                                  | P. & E. R. R.....           | 691          |
| ring Mill.....                           | Phil. & R. R. R.....        | 61           |
| 'llo Station.....                        | L. & Q. R. R.....           | 449          |
| od Junction.....                         | M., H. & S. H. R. R.....    | 671          |
| se.....                                  | P. & E. R. R.....           | 1,804        |
| and.....                                 | E. & P. R. R.....           | 841          |



| Station.                                | Authority.                   | Elevation.   |
|-----------------------------------------|------------------------------|--------------|
|                                         |                              | <i>Feet.</i> |
| Wheelerville .....                      | S. W. Pa. Extension .....    | 899          |
| Whetham .....                           | P. & E. R. R. ....           | 619          |
| White Bear .....                        | W. & R. R. R. ....           | 349          |
| White Deer .....                        | C. & W. R. R. ....           | 476          |
| Whitehall .....                         | Lehigh Valley R. R. ....     | 301          |
| White Haven .....                       | Lehigh Valley R. R. ....     | 1, 143       |
| Do. ....                                | L. & S. R. R. ....           | 1, 120       |
| White Horse .....                       | Chester Valley R. R. ....    | 339          |
| Do. ....                                | S. & S. R. R. ....           | 612          |
| White Mills .....                       | N. Y., L. E. & W. R. R. .... | 940          |
| White Rock .....                        | P. & C. R. R. ....           | 907          |
| White Rock Station .....                | A. V. R. R. ....             | 782          |
| Wilcox .....                            | P. & E. R. R. ....           | 1, 527       |
| Do. ....                                | S., L. & S. R. R. ....       | 1, 123       |
| Wildwood Station .....                  | A. V. R. R. ....             | 746          |
| Wilkesbarre .....                       | Lehigh Valley R. R. ....     | 549          |
| Wilkesburg Station .....                | Pennsylvania R. R. ....      | 923          |
| Williamsburgh .....                     | Pennsylvania R. R. ....      | 847          |
| Do. .... R. R. junction. ....           | Pennsylvania R. R. ....      | 876          |
| Williamsport Depot .....                | C. & W. R. R. ....           | 531          |
| Do. ....                                | J. S., P. C. & B. R. R. .... | 529          |
| Do. ....                                | N. C. R. R. ....             | 532          |
| Do. ....                                | P. & E. R. R. ....           | 527          |
| Williamstown, Summit Br. Colliery ..... | S. H. R. R. ....             | 1, 127       |
| Willow Grove .....                      | Del., L. & W. R. R. ....     | 516          |
| Do. ....                                | N. E. Pa. R. R. ....         | 259          |
| Do. ....                                | P., C. & St. L. R. R. ....   | 986          |
| Wilmarth .....                          | P. & E. R. R. ....           | 1, 447       |
| Wilmington .....                        | N. C. & F. R. R. ....        | 928          |
| Wilmore .....                           | Pa. R. R. ....               | 1, 557       |
| Windsor .....                           | P. B. R. R. ....             | 599          |
| Wissahickon .....                       | Phil. & R. R. R. ....        | 89           |
| Wistar .....                            | P. & E. R. R. ....           | 739          |
| Wistar's Run .....                      | C. & P. D. R. R. ....        | 229          |
| Wolfon .....                            | D., H. & W. R. R. ....       | 1, 023       |
| Wolverton .....                         | D., H. & W. R. R. ....       | 442          |
| Womelsdorf .....                        | Lebanon Valley R. R. ....    | 466          |
| Woodbine, B. M. ....                    | P. B. R. R. ....             | 294          |
| Woodland .....                          | P. & B. C. R. R. ....        | 212          |
| Do. ....                                | T. & C. R. R. ....           | 1, 472       |
| Do. ....                                | W. C. R. R. ....             | 581          |
| Wood's Run .....                        | P., Ft. W. & C. R. R. ....   | 731          |
| Woodstock, at crossing of creek .....   | Mt. A. R. R. ....            | 715          |
| Woodville .....                         | Chartiers R. R. ....         | 804          |
| Wrightsville .....                      | York Branch P. R. R. ....    | 257          |
| Wyalusing .....                         | Lehigh Valley R. R. ....     | 674          |
| Wylie's .....                           | P., V. & C. R. R. ....       | 759          |
| Wynnewood .....                         | Pa. R. R. ....               | 315          |
| Wyoming Station .....                   | Del., L. & W. R. R. ....     | 598          |
| Wysanking .....                         | Lehigh Valley ....           | 718          |
| Yeagertown .....                        | M. & C. Co. R. R. ....       | 534          |
| Yellow Spring .....                     | S. & S. R. R. ....           | 777          |
| Yerke's .....                           | Perkiomen R. R. ....         | 134          |
| York .....                              | N. C. R. R. ....             | 366          |
| Do. ....                                | P. B. R. R. ....             | 381          |
| York Furnace .....                      | C. & P. D. R. R. ....        | 177          |
| York Haven .....                        | N. C. R. R. ....             | 291          |
| York (N. Central R. R.) .....           | York Branch Pa. R. R. ....   | 379          |
| Youngsville .....                       | D., A. V. & P. R. R. ....    | 1, 197       |
| Do. ....                                | P. & E. R. R. ....           | 1, 211       |
| Youngwood .....                         | S. W. Pa. R. R. ....         | 957          |

# RHODE ISLAND.

| Station.                           | Authority.                         | Elevation.   |
|------------------------------------|------------------------------------|--------------|
|                                    |                                    | <i>Feet.</i> |
| Albion .....                       | Prov. & Worces. R. R .....         | 88           |
| Allendale .....                    | Prov. & Spring. R. R .....         | 104          |
| Allenville .....                   | Prov. & Spring. R. R .....         | 134          |
| Apponang .....                     | N. Y., Prov. & Bost. R. R .....    | 25           |
| Ashton .....                       | Prov. & Worces. R. R .....         | 76           |
| Auburn .....                       | N. Y., Prov. & Boston R. R .....   | 43           |
| Barrington .....                   | Prov., Warren & Bristol R. R ..... | 22           |
| Berkley .....                      | Prov. & Worces. R. R .....         | 69           |
| Bristol .....                      | Prov., Warren & Bristol R. R ..... | 17           |
| Carolina .....                     | N. Y., Prov. & Bost. R. R .....    | 89           |
| Cedar Grove .....                  | Prov., Warren & Bristol R. R ..... | 36           |
| Central Falls .....                | Prov. & Worces. R. R .....         | 70           |
| Centredale .....                   | P. & S. R. R .....                 | 104          |
| Cowesett .....                     | N. Y., Prov. & Bost. R. R .....    | 29           |
| Daviaville .....                   | N. Y., Prov. & Bost. R. R .....    | 55           |
| Drownville .....                   | Prov., Warren & Brist. R. R .....  | 30           |
| Dyerville .....                    | Prov. & Spring. R. R .....         | 74           |
| East Providence .....              | Prov., Warren & Brist. R. R .....  | 20           |
| Georgiaville .....                 | Prov. & Spring. R. R .....         | 164          |
| Graystone .....                    | Prov. & Spring. R. R .....         | 114          |
| Greenwich .....                    | N. Y., Prov. & Bost. R. R .....    | 32           |
| Hamlet .....                       | Prov. & Worces. R. R .....         | 146          |
| Harrisville .....                  | Prov. & Spring. R. R .....         | 326          |
| Hills Grove .....                  | N. Y., Prov. & Bost. R. R .....    | 55           |
| Kingston Junction .....            | N. Y., Prov. & Bost. R. R .....    | 111          |
| Lonsdale .....                     | Prov. & Worces. R. R .....         | 66           |
| Manton .....                       | Prov. & Spring. R. R .....         | 74           |
| Manville .....                     | Prov. & Worces. R. R .....         | 105          |
| Nayatt .....                       | Prov., Warren & Bristol R. R ..... | 24           |
| Newport, Signal Station .....      | U. S. Signal Office .....          | 44           |
| New Shoreham, Signal Station ..... | U. S. Signal Office .....          | 27           |
| Niantic .....                      | N. Y., Prov. & Bost. R. R .....    | 44           |
| Norwood .....                      | N. Y., Prov. & Bost. R. R .....    | 58           |
| Oakland .....                      | Prov. & Spring. R. R .....         | 308          |
| Olneyville .....                   | Prov. & Spring. R. R .....         | 49           |
| Pascoag .....                      | Prov. & Spring. R. R .....         | 396          |
| Pawtucket .....                    | Bost. & Prov. R. R .....           | 79           |
| Do .....                           | Prov. & Worces. R. R .....         | 73           |
| Providence .....                   | Bost. & Prov. R. R .....           | 10           |
| Do .....                           | N. Y., Prov. & Bost. R. R .....    | 12           |
| Richmond .....                     | N. Y., Prov. & Bost. R. R .....    | 87           |
| River Point .....                  | H. P. & F. R. R .....              | 93           |
| Slocumville .....                  | N. Y., P. & B. R. R .....          | 136          |
| Smithfield .....                   | Prov. & Spring. R. R .....         | 262          |
| Tar Kiln .....                     | Prov. & Spring. R. R .....         | 364          |
| Valley Falls .....                 | Prov. & Worces. R. R .....         | 68           |
| Warren .....                       | Prov., Warren & Bristol R. R ..... | 24           |
| Westerly .....                     | N. Y., P. & B. R. R .....          | 33           |
| Wickford Junction .....            | N. Y., P. & B. R. R .....          | 89           |
| Woodlawn .....                     | Prov. & Worces. R. R .....         | 56           |
| Wood River Junction .....          | N. Y., Prov. & Bost. R. R .....    | 56           |
| Woonsocket .....                   | Prov. & Worces. R. R .....         | 159          |

# SOUTH CAROLINA.

| Station.                           | Authority.                | Elevation.   |
|------------------------------------|---------------------------|--------------|
|                                    |                           | <i>Feet.</i> |
| Abbeville .....                    | C. & G. R. R. ....        | 535          |
| Adgers .....                       | C., C. & A. R. R. ....    | 540          |
| Aiken .....                        | S. Carolina R. R. ....    | 520          |
| Allendale .....                    | P. R. R. R. ....          | 192          |
| Alston .....                       | C. & G. R. R. ....        | 250          |
| Anderson .....                     | C. & G. R. R. ....        | 764          |
| Appleton .....                     | P. R. R. R. ....          | 292          |
| Augusta Bridge .....               | S. Carolina R. R. ....    | 185          |
| Barr's .....                       | C., C. & A. R. R. ....    | 458          |
| Batesburg .....                    | C., C. & A. R. R. ....    | 657          |
| Beaufort Wharf .....               | U. S. C. & G. S. ....     | 7            |
| Beaufort .....                     | P. R. R. R. ....          | 20           |
| Beldoc .....                       | P. R. R. R. ....          | 116          |
| Belton .....                       | C. & G. R. R. ....        | 596          |
| Birds Crossing .....               | C. & G. R. R. ....        | 760          |
| Blacks .....                       | A. & R. A. L. R. R. ....  | 172          |
| Blackstock .....                   | C., C. & A. R. R. ....    | 621          |
| Blackville .....                   | S. Carolina R. R. ....    | 301          |
| Blair's .....                      | C. & G. R. R. ....        | 233          |
| Blythwood .....                    | C., C. & A. R. R. ....    | 505          |
| Bookman's .....                    | C. & G. R. R. ....        | 204          |
| Branchville .....                  | S. Carolina R. R. R. .... | 140          |
| Brunson's .....                    | P. R. R. R. ....          | 139          |
| Cæsar's Head, hotel .....          | U. S. C. & G. S. ....     | 3, 118       |
| Carson's Hills .....               | S. Carolina R. R. ....    | 370          |
| Chappell's .....                   | C. & G. R. R. ....        | 402          |
| Charleston .....                   | S. Carolina R. R. ....    | 16           |
| Do .....                           | S. & C. R. R. ....        | 9            |
| Do .. Signal Station .....         | U. S. Signal Office ..... | 52           |
| Chester .....                      | C., C. & A. R. R. ....    | 543          |
| Clinton .....                      | C. & G. R. R. ....        | 637          |
| Columbia .....                     | C. & G. R. R. ....        | 227          |
| Do .. Blading street Station ..... | C., C. & A. R. R. ....    | 296          |
| Do .. S. C. R. R. Station .....    | C., C. & A. R. R. ....    | 233          |
| Do .. Old Junction .....           | C., C. & A. R. R. ....    | 195          |
| Cornwalls .....                    | C., C. & A. R. R. ....    | 638          |
| Dankins .....                      | C. & G. R. R. ....        | 266          |
| Dead Fall .....                    | C., C. & A. R. R. ....    | 156          |
| Donalds .....                      | C. & G. R. R. ....        | 760          |
| Dysons .....                       | C. & G. R. R. ....        | 420          |
| Early Branch .....                 | P. R. R. R. ....          | 79           |
| Early Depot .....                  | U. S. C. & G. S. ....     | 1, 131       |
| Ellenton .....                     | P. R. R. R. ....          | 149          |
| Enono .....                        | A. & R. A. L. R. R. ....  | 957          |
| Fish Dam .....                     | C. & G. R. R. ....        | 408          |
| Fort Mill .....                    | C., C. & A. R. R. ....    | 336          |
| Frosts Mill .....                  | C. & G. R. R. ....        | 179          |
| Furman University .....            | U. S. C. & G. S. ....     | 1, 074       |
| Garey's Lane .....                 | C. & G. R. R. ....        | 580          |
| Glassy .....                       | U. S. C. & G. S. ....     | 1, 699       |
| Glassy Rock .....                  | U. S. C. & G. S. ....     | 3, 076       |
| Glendale's .....                   | C. & G. R. R. ....        | 708          |
| Golden Grove .....                 | C. & G. R. R. ....        | 900          |
| Grantsville .....                  | C., C. & A. R. R. ....    | 243          |
| Greenville .....                   | A. & R. A. L. R. R. ....  | 976          |
| Do .....                           | C. & G. R. R. ....        | 989          |
| Do .. Episcopal Church .....       | U. S. C. & G. S. ....     | 1, 105       |
| Do .. Baptist Church .....         | U. S. C. & G. S. ....     | 908          |

| Station.                  | Authority.              | Elevation.   |
|---------------------------|-------------------------|--------------|
|                           |                         | <i>Feet.</i> |
| ood.....                  | C. & G. R. R.....       | 671          |
| ee.....                   | U. S. C. & G. S.....    | 17           |
| ee.....                   | C. & G. R. R.....       | 532          |
| .....                     | C. & G. R. R.....       | 714          |
| k.....                    | U. S. C. & G. S.....    | 3,230        |
| Path.....                 | C. & G. R. R.....       | 810          |
| .....                     | C. & G. R. R.....       | 297          |
| iboro Depot.....          | S. & C. R. R.....       | 17           |
| .....                     | C. & G. R. R.....       | 576          |
| on.....                   | C., C. & A. R. R.....   | 670          |
| lle.....                  | C. & G. R. R.....       | 583          |
| s.....                    | C., C. & A. R. R.....   | 546          |
| s.....                    | C., C. & A. R. R.....   | 331          |
| s.....                    | C. & G. R. R.....       | 602          |
| ys.....                   | C., C. & A. R. R.....   | 200          |
| is.....                   | C. & G. R. R.....       | 589          |
| le.....                   | C., C. & A. R. R.....   | 645          |
| .....                     | C., C. & A. R. R.....   | 574          |
| ton.....                  | C., C. & A. R. R.....   | 370          |
| one.....                  | A. & R. A. L. R. R..... | 787          |
| s.....                    | C. & G. R. R.....       | 619          |
| n.....                    | U. S. C. & G. S.....    | 1,328        |
| lill.....                 | C., C. & A. R. R.....   | 443          |
| .....                     | P. R. R. R.....         | 135          |
| emery's.....              | C. & G. R. R.....       | 199          |
| rry.....                  | C. & G. R. R.....       | 502          |
| arket.....                | C. & G. R. R.....       | 630          |
| Six.....                  | C. & G. R. R.....       | 570          |
| burgh.....                | S. Carolina R. R.....   | 265          |
| t.....                    | C. & G. R. R.....       | 718          |
| Point.....                | U. S. C. & G. S.....    | 29           |
| .....                     | U. S. C. & G. S.....    | 2,054        |
| , T.O.....                | C. & G. R. R.....       | 704          |
| .....                     | C. & G. R. R.....       | 291          |
| stt.....                  | A. & R. A. L. R. R..... | 857          |
| ton.....                  | A. & R. A. L. R. R..... | 879          |
| .....                     | C. & G. R. R.....       | 817          |
| s C. H.....               | U. S. C. & G. S.....    | 1,162        |
| sville.....               | A. & R. A. L. R. R..... | 1,094        |
| nt.....                   | C. & G. R. R.....       | 794          |
| le.....                   | U. S. C. & G. S.....    | 3,436        |
| a.....                    | C. & G. R. R.....       | 330          |
| oyal.....                 | P. R. R. R.....         | 11           |
| rity.....                 | C. & G. R. R.....       | 551          |
| ountain.....              | U. S. C. & G. S.....    | 3,569        |
| Spring.....               | C., C. & A. R. R.....   | 647          |
| ray.....                  | C., C. & A. R. R.....   | 626          |
| son.....                  | C., C. & A. R. R.....   | 562          |
| fill.....                 | C., C. & A. R. R.....   | 609          |
| Mountain.....             | U. S. C. & G. S.....    | 1,029        |
| ity.....                  | A. & R. A. L. R. R..... | 1,006        |
| , old town.....           | C. & G. R. R.....       | 386          |
| .....                     | C. & G. R. R.....       | 512          |
| .....                     | A. & R. A. L. R. R..... | 954          |
| .....                     | C., C. & A. R. R.....   | 444          |
| n.....                    | P. R. R. R.....         | 21           |
| i.....                    | C. & G. R. R.....       | 315          |
| ds.....                   | C. & G. R. R.....       | 1,000        |
| Street.....               | C. & G. R. R.....       | 470          |
| ns.....                   | C., C. & A. R. R.....   | 604          |
| le Mountain.....          | U. S. C. & G. S.....    | 1,595        |
| .....                     | C., C. & A. R. R.....   | 545          |
| nburgh.....               | A. & R. A. L. R. R..... | 787          |
| ..... Baptist Church..... | U. S. C. & G. S.....    | 887          |

| Station.                               | Authority.               | Elevat |
|----------------------------------------|--------------------------|--------|
| Spartanburgh, S. U. & C. D. R. R ..... | C. & G. R. R .....       | 1      |
| Do ..... St. John's College.....       | U. S. C. & G. S .....    |        |
| Strothers.....                         | C. & G. R. R .....       |        |
| Summerville .....                      | S. Carolina R. R .....   |        |
| Table Rock .....                       | U. S. C. & G. S .....    | 3      |
| Thicketty.....                         | U. S. C. & G. S .....    | 1      |
| Tuccoa .....                           | U. S. C. & G. S .....    | 1      |
| Trenton .....                          | C., C. & A. R. R .....   |        |
| Union .....                            | C. & G. R. R .....       |        |
| Vancluse.....                          | C., C. & A. R. R .....   |        |
| Varnesville .....                      | P. R. R. R .....         |        |
| Union .....                            | C. & G. R. R .....       |        |
| Walhalla.....                          | U. S. C. & G. S .....    |        |
| Do.. Church.....                       | U. S. C. & G. S .....    | 1      |
| Wards .....                            | C., C. & A. R. R .....   |        |
| Warrens .....                          | C., C. & A. R. R .....   |        |
| Westminster .....                      | A. & R. A. L. R. R ..... |        |
| Whitakers .....                        | A. & R. A. L. R. R ..... |        |
| White Oak .....                        | C., C. & A. R. R .....   |        |
| Williamston .....                      | C. & G. R. R .....       |        |
| Willow Oak .....                       | U. S. C. & G. S .....    |        |
| Winnaborough .....                     | C., C. & A. R. R .....   |        |
| Wofford .....                          | U. S. C. & G. S .....    |        |
| Woodwards .....                        | U. S. C. & G. S .....    |        |
| Yemassee .....                         | S. Carolina R. R .....   |        |
| Do .....                               | U. S. C. & G. S .....    |        |
| Do...crossing of S. & C. R. R .....    | P. R. R. R .....         |        |

# TENNESSEE.

| Station.                   | Authority.               | Elevation.   |
|----------------------------|--------------------------|--------------|
|                            |                          | <i>Feet.</i> |
| Albany.....                | L., N., S. & N. A. R. R. | 564          |
| Allens.....                | L., N., S. & N. A. R. R. | 353          |
| Amnicola.....              | W. & A. R. R.            | 695          |
| Annadell.....              | C. S. R. R.              | 1,249        |
| Aspen Hill.....            | L., N., S. & N. A. R. R. | 648          |
| Athens.....                | E. T., Va. & Ga. R. R.   | 933          |
| Atwood.....                | L., N., S. & N. A. R. R. | 428          |
| Bailey's.....              | L., N., S. & N. A. R. R. | 664          |
| Bartlett.....              | L., N., S. & N. A. R. R. | 263          |
| Belfast.....               | D. R. V. R. R.           | 814          |
| Bells.....                 | L., N., S. & N. A. R. R. | 320          |
| Benton Switch.....         | L., N., S. & N. A. R. R. | 374          |
| Bethel.....                | M. & O. R. R.            | 463          |
| Big Hatchie.....           | L., N., S. & N. A. R. R. | 286          |
| Big Sandy.....             | L., N., S. & N. A. R. R. | 345          |
| Big Stone Mountain.....    | Guyot                    | 5,614        |
| Bolivar.....               | M. C. & T. R. R.         | 430          |
| Bond's.....                | L., N., S. & N. A. R. R. | 314          |
| Boyce.....                 | C. S. R. R.              | 694          |
| Branden.....               | L., N., S. & N. A. R. R. | 307          |
| Brentwood.....             | L., N., S. & N. A. R. R. | 698          |
| Bristol.....               | N. & W. R. R.            | 1,689        |
| Brown's Road.....          | L., N., S. & N. A. R. R. | 476          |
| Brownsville.....           | L., N., S. & N. A. R. R. | 333          |
| Bryant.....                | D. R. V. R. R.           | 671          |
| Buck Lodge.....            | L., N., S. & N. A. R. R. | 711          |
| Buford's.....              | L., N., S. & N. A. R. R. | 702          |
| Caledonia.....             | L., N., S. & N. A. R. R. | 421          |
| Campbells.....             | L., N., S. & N. A. R. R. | 686          |
| Carbondale.....            | L., N., S. & N. A. R. R. | 362          |
| Cargrove.....              | L., N., S. & N. A. R. R. | 246          |
| Carroll.....               | M. & O. R. R.            | 375          |
| Carter's Creek.....        | L., N., S. & N. A. R. R. | 602          |
| Cave Springs.....          | C. S. R. R.              | 697          |
| Chattanooga.....           | C. S. R. R.              | 684          |
| Do.....Signal Station..... | U. S. Signal Office..... | 783          |
| Cherry's.....              | L., N., S. & N. A. R. R. | 535          |
| Chewalla.....              | Memphis & C. R. R.       | 409          |
| Chickamauga.....           | W. & A. R. R.            | 685          |
| Chilhowee Mountain.....    | Guyot                    | 2,452        |
| Chimzy Knob.....           | Guyot                    | 5,588        |
| Chitwood.....              | C. S. R. R.              | 1,332        |
| Clarksville.....           | L., N., S. & N. A. R. R. | 392          |
| Cleveland.....             | E. T., Va. & Ga. R. R.   | 878          |
| Clifton.....               | L., N., S. & N. A. R. R. | 353          |
| Clingman's Dome.....       | Guyot                    | 6,660        |
| Colliersville.....         | Memphis & C. R. R.       | 379          |
| Collins, Mount.....        | Guyot                    | 6,188        |
| Columbia.....              | L., N., S. & N. A. R. R. | 644          |
| Corner Knob.....           | Guyot                    | 5,246        |
| Corrairie.....             | C. S. R. R.              | 813          |
| Coulterville.....          | C. S. R. R.              | 712          |
| Crockett.....              | M. & O. R. R.            | 296          |
| Cross Knob.....            | Guyot                    | 5,931        |
| Cumberland.....            | L., N., S. & N. A. R. R. | 355          |
| Curtis, Mount.....         | Guyot                    | 6,508        |
| Dark's Mill.....           | L., N., S. & N. A. R. R. | 574          |
| Darwin.....                | C. S. R. R.              | 767          |

| Station.                  | Authority.                    | Elevation.   |
|---------------------------|-------------------------------|--------------|
|                           |                               | <i>Feet.</i> |
| Dayton .....              | C. S. R. R. ....              | 715          |
| Dodsen's .....            | L., N., S. & N. A. R. R. .... | 804          |
| Duck River .....          | L., N., S. & N. A. R. R. .... | 578          |
| Dudley's .....            | L., N., S. & N. A. R. R. .... | 494          |
| Dyer .....                | M. & O. R. R. ....            | 365          |
| Eagle Top .....           | Guyot .....                   | 5,433        |
| Edgefield Junction .....  | L., N., S. & N. A. R. R. .... | 414          |
| Elk Ridge Summit .....    | D. R. V. R. R. ....           | 789          |
| Emory Gap .....           | C. S. R. R. ....              | 840          |
| Erin .....                | L., N., S. & N. A. R. R. .... | 404          |
| Ewells .....              | L., N., S. & N. A. R. R. .... | 747          |
| Ewings .....              | D. R. V. R. R. ....           | 730          |
| Fair Grounds .....        | L., N., S. & N. A. R. R. .... | 439          |
| Falcon .....              | M. & O. R. R. ....            | 433          |
| Fayetteville .....        | D. R. V. R. R. ....           | 656          |
| Forney Ridge Peak .....   | Guyot .....                   | 5,087        |
| Fountain Head .....       | L., N., S. & N. A. R. R. .... | 778          |
| Franklin .....            | L., N., S. & N. A. R. R. .... | 617          |
| Gadsden .....             | L., N., S. & N. A. R. R. .... | 406          |
| Gallatin .....            | L., N., S. & N. A. R. R. .... | 494          |
| Galloway .....            | L., N., S. & N. A. R. R. .... | 277          |
| Germantown .....          | Memphis & C. R. R. ....       | 378          |
| Gibson .....              | L., N., S. & N. A. R. R. .... | 378          |
| Givin .....               | L., N., S. & N. A. R. R. .... | 344          |
| Glen Alice .....          | C. S. R. R. ....              | 626          |
| Glen Mary .....           | C. S. R. R. ....              | 1,289        |
| Grand Junction .....      | Memphis & C. R. R. ....       | 575          |
| Gravel Pit .....          | L., N., S. & N. A. R. R. .... | 380          |
| Graysville .....          | C. S. R. R. ....              | 737          |
| Great Bald Mountain ..... | Guyot .....                   | 4,922        |
| Great Frog Mountain ..... | Guyot .....                   | 4,226        |
| Greenville .....          | E. T., Va. & Ga. R. R. ....   | 1,581        |
| Guyot, Mount .....        | Guyot .....                   | 6,636        |
| Hampton's .....           | L., N., S. & N. A. R. R. .... | 513          |
| Hangover .....            | Guyot .....                   | 5,600        |
| Harris .....              | D. R. V. R. R. ....           | 579          |
| Harwell .....             | L., N., S. & N. A. R. R. .... | 617          |
| Helenwood .....           | C. S. R. R. ....              | 1,400        |
| Henderson .....           | M. & O. R. R. ....            | 427          |
| Hendersonville .....      | L., N., S. & N. A. R. R. .... | 446          |
| Henry .....               | L., N., S. & N. A. R. R. .... | 518          |
| Do. Mount .....           | Guyot .....                   | 6,373        |
| Hills .....               | D. R. V. R. R. ....           | 600          |
| Humboldt .....            | L., N., S. & N. A. R. R. .... | 329          |
| Hurricane .....           | L., N., S. & N. A. R. R. .... | 630          |
| Jackson .....             | M. & O. R. R. ....            | 425          |
| Johnson .....             | E. T., Va. & Ga. R. R. ....   | 1,643        |
| Johnsonville .....        | N. & N. R. R. ....            | 368          |
| Jones .....               | L., N., S. & N. A. R. R. .... | 314          |
| Jonesboro .....           | E. T., Va. & Ga. R. R. ....   | 1,734        |
| Keeling .....             | D. R. V. R. R. ....           | 735          |
| Kenton .....              | M. & O. R. R. ....            | 309          |
| King's Point .....        | C. S. R. R. ....              | 696          |
| Knoxville .....           | E. T., Va. & Ga. R. R. ....   | 900          |
| Do. Signal Station .....  | U. S. Signal Office .....     | 980          |
| La Grange .....           | Memphis & C. R. R. ....       | 531          |
| Lansing .....             | C. S. R. R. ....              | 1,197        |
| Laurel Peak .....         | Guyot .....                   | 5,922        |
| Leconte, Mount .....      | Guyot .....                   | 6,612        |
| Lester's .....            | L., N., S. & N. A. R. R. .... | 723          |
| Lewisburgh .....          | D. R. V. R. R. ....           | 727          |
| Lookont .....             | C. S. R. R. ....              | 692          |
| Loudon .....              | E. T., Va. & Ga. R. R. ....   | 816          |
| Love, Mount .....         | Guyot .....                   | 6,443        |

| Station.                    | Authority.                     | Elevation.   |
|-----------------------------|--------------------------------|--------------|
|                             |                                | <i>Fect.</i> |
| Luftee Knob .....           | Guyot .....                    | 6, 232       |
| Lynnville .....             | L., N., S. & N. A. R. R. ....  | 734          |
| McElwee .....               | C. S. R. R. ....               | 788          |
| McKenzie .....              | L., N., S. & N. A. R. R. ....  | 470          |
| McNairy .....               | M. & O. R. R. ....             | 454          |
| Madison .....               | L., N., S. & N. A. R. R. ....  | 466          |
| Malory's .....              | L., N., S. & N. A. R. R. ....  | 674          |
| Mason .....                 | L., N., S. & N. A. R. R. ....  | 296          |
| Master Knob .....           | Guyot .....                    | 6, 013       |
| Matthews .....              | L., N., S. & N. A. R. R. ....  | 398          |
| Medon .....                 | M. C. & T. R. R. ....          | 420          |
| Melhorn .....               | C. S. R. R. ....               | 833          |
| Melville .....              | C. S. R. R. ....               | 711          |
| Memphis, city base .....    | City engineer .....            | 117          |
| Do .....                    | L., N., S. & N. A. R. R. ....  | 227          |
| Do .....                    | Miss. & Tenu. R. R. ....       | 258          |
| Do .....                    | M. & C. R. R. ....             | 244          |
| Do .....                    | U. S. Signal Office .....      | 321          |
| Middleburgh .....           | M. C. & T. R. R. ....          | 537          |
| Middleton .....             | Memphis & C. R. R. ....        | 408          |
| Milan .....                 | L., N., S. & N. A. R. R. ....  | 408          |
| Miller .....                | C. S. R. R. ....               | 847          |
| Mingus, Mount .....         | Guyot .....                    | 5, 094       |
| Mitchellville .....         | L., N., S. & N. A. R. R. ....  | 748          |
| Morristown .....            | E. T., Va. & Ga. R. R. ....    | 1, 283       |
| Moscow .....                | Memphis & C. R. R. ....        | 352          |
| Nashville, city base .....  | City engineer .....            | 232          |
| Do .....                    | L., N., S. & N. A. R. R. ....  | 409          |
| Do .....                    | N. & N. R. R. ....             | 430          |
| Do .....                    | N. & D. R. R. ....             | 445          |
| Do .....                    | H. W. Cumberland R. ....       | 397          |
| Do .....                    | L. W. Cumberland R. ....       | 340          |
| Do .....                    | Signal Station .....           | 507          |
| Neighbor .....              | Guyot .....                    | 5, 771       |
| Nemo .....                  | C. S. R. R. ....               | 917          |
| New Market .....            | E. T., Va. & Ga. R. R. ....    | 1, 057       |
| New River .....             | C. S. R. R. ....               | 1, 215       |
| North Bald Mountain .....   | Guyot .....                    | 4, 711       |
| Oakdale Junction .....      | C. S. R. R. ....               | 812          |
| Oak Hill .....              | L., N., S. & N. A. R. R. ....  | 355          |
| Oakland, top of ridge ..... | E., H. & N. R. R. ....         | 890          |
| Ocoee Mountain .....        | Guyot .....                    | 6, 135       |
| Oneida .....                | C. S. R. R. ....               | 1, 454       |
| Overtons .....              | L., N., S. & N. A. R. R. ....  | 533          |
| Owens .....                 | L., N., S. & N. A. R. R. ....  | 677          |
| Palmyra .....               | L., N., S. & N. A. R. R. ....  | 307          |
| Paris .....                 | L., N., S. & N., A. R. R. .... | 447          |
| Parks .....                 | D. R. V. R. R. ....            | 650          |
| Peapoint .....              | L., N., S. & N. A. R. R. ....  | 256          |
| Peck's Peak .....           | Guyot .....                    | 6, 232       |
| Petersburgh .....           | D. R. V. R. R. ....            | 727          |
| Pilot Knob .....            | L., N., S. & N. A. R. R. ....  | 447          |
| Pilot Mountain .....        | C. S. R. R. ....               | 1, 348       |
| Pinson .....                | M. & O. R. R. ....             | 384          |
| Pleasant Grove .....        | L., N., S. & N., A. R. R. .... | 719          |
| Pocahontas .....            | Memphis & C. R. R. ....        | 394          |
| Porters .....               | L., N., S. & N. A. R. R. ....  | 352          |
| Prospect .....              | L., N., S. & N. A. R. R. ....  | 588          |
| Pulaski .....               | L., N., S. & N. A. R. R. ....  | 641          |
| Ramer .....                 | M. & O. R. R. ....             | 416          |
| Rathburn .....              | C. S. R. R. ....               | 788          |
| Raven Knob .....            | Guyot .....                    | 6, 230       |
| Retrio .....                | C. S. R. R. ....               | 747          |
| Reynolds .....              | L., N., S. & N. A. R. R. ....  | 724          |



| Station.                      | Authority.                    | Elevation.   |
|-------------------------------|-------------------------------|--------------|
|                               |                               | <i>Feet.</i> |
| Richland.....                 | L., N., S. & N. A. R. R.....  | 774          |
| Rives.....                    | M. & O. R. R.....             | 301          |
| Robbins.....                  | C. S. R. R.....               | 1,398        |
| Rock Creek.....               | C. S. R. R.....               | 753          |
| Rockwood.....                 | C. S. R. R.....               | 885          |
| Roddy.....                    | C. S. R. R.....               | 784          |
| Rosboro'.....                 | D. R. V. R. R.....            | 706          |
| Rosville.....                 | Memphis & C. R. R.....        | 316          |
| Rutherford.....               | M. & O. R. R.....             | 331          |
| Safford, Mount.....           | Guyot.....                    | 6,535        |
| Sailor's Rest.....            | L., N., S. & N. A. R. R.....  | 364          |
| Saulsbury.....                | Memphis & C. R. R.....        | 536          |
| Saundersville.....            | L., N., S. & N. A. R. R.....  | 545          |
| Sedgemore.....                | C. S. R. R.....               | 1,401        |
| Shelby's.....                 | L., N., S. & N. A. R. R.....  | 249          |
| Shepard's.....                | L., N., S. & N. A. R. R.....  | 279          |
| Silver Creek.....             | D. R. V. R. R.....            | 702          |
| Snaky Mountain.....           | Guyot.....                    | 5,195        |
| South Berlin.....             | D. R. V. R. R.....            | 775          |
| South Tunnel.....             | L., N., S. & N. A. R. R.....  | 804          |
| Spring City.....              | C. S. R. R.....               | 781          |
| Springdale.....               | L., N., S. & N. A. R. R.....  | 256          |
| Springville.....              | L., N., S. & N. A. R. R.....  | 340          |
| Staunton.....                 | L., N., S. & N. A. R. R.....  | 303          |
| Steele's.....                 | L., N., S. & N. A. R. R.....  | 365          |
| Stevenson.....                | L., N., S. & N. A. R. R.....  | 709          |
| Stewarts.....                 | L., N., S. & N. A. R. R.....  | 464          |
| Sunbright.....                | C. S. R. R.....               | 1,359        |
| Talleys.....                  | D. R. V. R. R.....            | 789          |
| Taylor's.....                 | L., N., S. & N. A. R. R.....  | 307          |
| Tennessee Ridge.....          | L., N., S. & N. A. R. R.....  | 720          |
| Thermometer Knob.....         | Guyot.....                    | 6,157        |
| Thompsons.....                | L., N., S. & N. A. R. R.....  | 777          |
| Three Brothers (highest)..... | Guyot.....                    | 5,907        |
| Thunderhead.....              | Guyot.....                    | 5,590        |
| Thunderknob.....              | Guyot.....                    | 5,682        |
| Trenton.....                  | M. & O. R. R.....             | 391          |
| Trezernant.....               | L., N., S. & N., A. R. R..... | 443          |
| Tricornet Knob.....           | Guyot.....                    | 6,188        |
| Turkey Knob.....              | Guyot.....                    | 4,740        |
| Union.....                    | E. T., Va. & Ga. R. R.....    | 1,457        |
| Union City.....               | M. & O. R. R.....             | 346          |
| Vernon Furnace.....           | L., N., S. & N. A. R. R.....  | 367          |
| Veto.....                     | L., N., S. & N. A. R. R.....  | 619          |
| Wales.....                    | L., N., S. & N. A. R. R.....  | 668          |
| Ward.....                     | D. R. V. R. R.....            | 739          |
| Wanhatchie.....               | Ala. G. S. R. R.....          | 690          |
| Wells.....                    | L., N., S. & N. A. R. R.....  | 242          |
| West Harpeth.....             | L., N., S. & N. A. R. R.....  | 670          |
| Whitesburgh.....              | E. T., Va. & Ga. R. R.....    | 1,214        |
| Withe.....                    | L., N., S. & N. A. R. R.....  | 271          |

# TEXAS.

| Station.                                      | Authority.                   | Elevation.   |
|-----------------------------------------------|------------------------------|--------------|
|                                               |                              | <i>Feet.</i> |
| Albany.....                                   | T. C. R. R.....              | 1,401        |
| Alexander.....                                | T. C. R. R.....              | 1,141        |
| Allen.....                                    | H. & T. C. R. R.....         | 669          |
| Alleyton.....                                 | G., H. & S. A. R. R.....     | 193          |
| Ames.....                                     | T. & N. O. R. R.....         | 78           |
| Angus.....                                    | H. & T. C. R. R.....         | 448          |
| Aquilla.....                                  | T. C. R. R.....              | 531          |
| Arcola.....                                   | I. & G. N. R. R.....         | 66           |
| Arroyo Escondido.....                         | Toner.....                   | 2,115        |
| Austin.....                                   | I. & G. N. R. R.....         | 477          |
| Do. (Freight Depot).....                      | H. & T. C. R. R.....         | 501          |
| Do. (Passenger Depot).....                    | H. & T. C. R. R.....         | 513          |
| Baird.....                                    | T. & P. R. R.....            | 1,524        |
| Banks.....                                    | G., C. & S. F. R. R.....     | 702          |
| Beaumont.....                                 | T. & N. O. R. R.....         | 26           |
| Belknap, Fort.....                            | Med. Dept. U. S. A.....      | 1,600        |
| Belleville.....                               | G., C. & S. F. R. R.....     | 262          |
| Bells.....                                    | Mo., Kans. & Tex. R. R.....  | 675          |
| Belmont Farm.....                             | Toner.....                   | 722          |
| Belton.....                                   | G., C. & S. F. R. R.....     | 620          |
| Benchley.....                                 | H. & T. C. R. R.....         | 306          |
| Big Mineral.....                              |                              | 1,228        |
| Big Sandy, cross. T. & T. R. R. at grade..... | T. & P. R. R.....            | 336          |
| Bliss, Fort.....                              | Med. Dept. U. S. A.....      | 3,830        |
| Do.....Astronomical monument.....             | Wheeler.....                 | 3,623        |
| Bluff.....                                    | Toner.....                   | 180          |
| Blum.....                                     | G., C. & S. F. R. R.....     | 592          |
| Bonham.....                                   | T. & P. R. R.....            | 582          |
| Borden.....                                   | G., H. & S. A. R. R.....     | 303          |
| Boston.....                                   | Smithsonian Inst.....        | 600          |
| Brackettville, Signal Station.....            | U. S. Signal Office.....     | 1,137        |
| Brazos.....                                   | G., C. & S. F. R. R.....     | 70           |
| Bremond.....                                  | H. & T. C. R. R.....         | 467          |
| Brenham.....                                  | G., C. & S. F. R. R.....     | 301          |
| Do.....                                       | H. & T. C. R. R.....         | 350          |
| Briar Creek.....                              | Toner.....                   | 378          |
| Brown, Fort.....                              | Mexican Boundary Survey..... | 165          |
| Browns.....                                   | L. & S. V. R. R.....         | 286          |
| Brownsville.....                              | R. G. R. R.....              | 33           |
| Do.....Signal Station.....                    | U. S. Signal Office.....     | 43           |
| Bryan.....                                    | H. & T. C. R. R.....         | 371          |
| Buffalo.....                                  | I. & G. N. R. R.....         | 387          |
| Buffalo Springs.....                          | Smithsonian Inst.....        | 1,800        |
| Burton.....                                   | H. & T. C. R. R.....         | 436          |
| Caldwell.....                                 | G., C. & S. F. R. R.....     | 411          |
| Calvert.....                                  | H. & T. C. R. R.....         | 337          |
| Camden.....                                   | L. & S. V. R. R.....         | 234          |
| Cameron.....                                  | G., C. & S. F. R. R.....     | 407          |
| Canyon.....                                   | T. & P. R. R.....            | 1,015        |
| Carbon.....                                   | T. C. R. R.....              | 1,592        |
| Castroville.....                              | Mexican Boundary Survey..... | 672          |
| Do.....Signal Station.....                    | U. S. Signal Office.....     | 778          |
| Cedar Grove.....                              | Toner.....                   | 60           |
| Chadbourne, Fort.....                         | Med. Dept. U. S. A.....      | 2,120        |
| Chapel Hill.....                              | H. & T. C. R. R.....         | 337          |
| Chappel Hill.....                             | Smithsonian Inst.....        | 542          |
| Chenango.....                                 | I. & G. N. R. R.....         | 46           |

| Station.                                         | Authority.                   | Elevation.   |
|--------------------------------------------------|------------------------------|--------------|
|                                                  |                              | <i>Feet.</i> |
| China Grove .....                                | I. & G. N. R. R. ....        | 50           |
| Chocolate .....                                  | G., C. & S. F. R. R. ....    | 56           |
| Cisco (T. & P. crossing) .....                   | T. C. R. R. ....             | 1,611        |
| Clark, Fort .....                                | Med. Dept. U. S. A. ....     | 1,000        |
| Clarksville .....                                | T. & P. R. R. ....           | 464          |
| Clear Lake .....                                 | G., C. & S. F. R. R. ....    | 68           |
| Cleburne .....                                   | G., C. & S. F. R. R. ....    | 933          |
| Clifton .....                                    | G., C. & S. F. R. R. ....    | 670          |
| Columbia .....                                   | I. & G. N. R. R. ....        | 34           |
| Columbus .....                                   | G., H. & S. A. R. R. ....    | 213          |
| Comanche Spring .....                            | Toner .....                  | 2,674        |
| Concho, Signal Station .....                     | U. S. Signal Office .....    | 1,488        |
| Concordia, Camp .....                            | Smithsonian Inst .....       | 3,600        |
| Concrete .....                                   | G., W. T. & P. R. R. ....    | 246          |
| Cone .....                                       | G., C. & S. F. R. R. ....    | 375          |
| Converse .....                                   | G., H. & S. A. R. R. ....    | 721          |
| Corpus Christi .....                             | Med. Dept. U. S. A. ....     | 20           |
| Corsicana .....                                  | H. & T. C. R. R. ....        | 427          |
| Do... Signal Station .....                       | U. S. Signal Office .....    | 448          |
| Courtney .....                                   | H. & T. C. R. R. ....        | 201          |
| Crabb .....                                      | G., C. & S. F. R. R. ....    | 91           |
| Crawford .....                                   | G., C. & S. F. R. R. ....    | 667          |
| Crockett .....                                   | I. & G. N. R. R. ....        | 350          |
| Croghan, Fort .....                              | Med. Dept. U. S. A. ....     | 1,000        |
| Crosby .....                                     | T. & N. O. R. R. ....        | 50           |
| Cross Roads .....                                | Smithsonian Inst .....       | 672          |
| Cross Timbers .....                              | I. & G. N. R. R. ....        | 75           |
| Do .....                                         | T. & N. O. R. R. ....        | 52           |
| Cuero .....                                      | G., W. T. & P. R. R. ....    | 177          |
| Cypress City .....                               | H. & T. C. R. R. ....        | 155          |
| Dangerfield .....                                | E. L. & R. R. R. R. ....     | 403          |
| Dallas, crossing H. & T. C. R. R. at grade ..... | T. & P. R. R. ....           | 466          |
| Do Junction W. R. R. ....                        | T. & P. R. R. ....           | 432          |
| Davidson .....                                   | G., C. & S. F. R. R. ....    | 255          |
| Davis, Fort .....                                | Med. Dept. U. S. A. ....     | 4,700        |
| Do... Signal Station .....                       | U. S. Signal Office .....    | 4,918        |
| Dayton .....                                     | T. & N. O. R. R. ....        | 89           |
| De Kalb .....                                    | T. & P. R. R. ....           | 422          |
| Deloraine .....                                  | Toner .....                  | 960          |
| Denison .....                                    | Mo., Kans. & Tex. R. R. .... | 722          |
| Do low water Red River .....                     | Mo., Kans. & Tex. R. R. .... | 525          |
| Do Junction H. & T. C. R. R. ....                | Mo., Kans. & Tex. R. R. .... | 723          |
| Do Signal Station .....                          | U. S. Signal Office .....    | 767          |
| Deveres .....                                    | T. & N. O. R. R. ....        | 66           |
| Dodge .....                                      | I. & G. N. R. R. ....        | 409          |
| Double Mountain .....                            | Petermann .....              | 3,824        |
| Douglas .....                                    | I. & G. N. R. R. ....        | 307          |
| Dublin .....                                     | T. C. R. R. ....             | 1,449        |
| Duncan, Fort .....                               | Med. Dept. U. S. A. ....     | 1,460        |
| Dyer .....                                       | G., C. & S. F. R. R. ....    | 116          |
| Eagle Lake .....                                 | G., H. & S. A. R. R. ....    | 203          |
| Eagle Pass, Signal Station .....                 | U. S. Signal Office .....    | 200          |
| Eagle Spring .....                               | Mex. Boundary Survey .....   | 4,536        |
| East Barnard .....                               | G., H. & S. A. R. R. ....    | 123          |
| Eastland .....                                   | T. & P. R. ....              | 1,299        |
| East Santa Clara .....                           | G., H. & S. A. R. R. ....    | 633          |
| East Waco .....                                  | H. & T. C. R. R. ....        | 295          |
| Edinburg .....                                   | Mex. Boundary Survey .....   | 422          |
| Elciario .....                                   | Toner .....                  | 3,607        |
| Elgin .....                                      | H. & T. C. R. R. ....        | 600          |
| Elkhart .....                                    | I. & G. N. R. R. ....        | 390          |
| Elmo .....                                       | T. & P. R. R. ....           | 501          |
| El Paso .....                                    | S. P. R. R. ....             | 3,720        |
| Do Signal Station .....                          | U. S. Signal Office .....    | 3,370        |

| Station.                                       | Authority.                | Elevation.   |
|------------------------------------------------|---------------------------|--------------|
|                                                |                           | <i>Feet.</i> |
| wood.....                                      | I. & G. N. R. R.....      | 420          |
|                                                | H. & T. C. R. R.....      | 547          |
| lido Spring.....                               | Mex. Boundary Survey..... | 2,806        |
|                                                | H. & T. C. R. R.....      | 69           |
| Fort.....                                      | Med. Dept. U. S. A.....   | 200          |
|                                                | H. & T. C. R. R.....      | 472          |
| ia.....                                        | G., H. & S. A. R. R.....  | 473          |
|                                                | I. & G. N. R. R.....      | 273          |
|                                                | T. & P. R. R.....         | 469          |
| North.....                                     | T. & P. R. R.....         | 623          |
|                                                | T. C. R. R.....           | 581          |
| icksburgh, Signal Station.....                 | U. S. Signal Office.....  | 1,742        |
| ra.....                                        | Mex. Boundary Survey..... | 3,796        |
|                                                | Toner.....                | 242          |
| ton.....                                       | G., C. & S. F. R. R.....  | 3            |
| Signal Station.....                            | U. S. Signal Office.....  | 40           |
| t.....                                         | H. & T. C. R. R.....      | 563          |
| Fort.....                                      | Toner.....                | 1,000        |
|                                                | I. & G. N. R. R.....      | 376          |
| town.....                                      | I. & G. N. R. R.....      | 753          |
| gs.....                                        | H. & T. C. R. R.....      | 536          |
| water.....                                     | T. & P. R. R.....         | 324          |
|                                                | Smithsonian Inst.....     | 50           |
| es (Court-House).....                          | G., W. T. & P. R. R.....  | 276          |
| ...Gnadalupe River, ordinary height<br>of..... | G. W. T. & P. R. R.....   | 232          |
|                                                | T. & P. R. R.....         | 622          |
| n, Fort.....                                   | Med. Dept. U. S. A.....   | 900          |
| Saline.....                                    | T. & P. R. R.....         | 400          |
| and.....                                       | I. & G. N. R. R.....      | 480          |
| Lake.....                                      | I. & G. N. R. R.....      | 136          |
| Signal Station.....                            | U. S. Signal Office.....  | 1,243        |
| eck.....                                       | H. & T. C. R. R.....      | 481          |
| lupe Pass.....                                 | P. R. R. Reports.....     | 5,717        |
| sland.....                                     | H. & T. C. R. R.....      | 96           |
| prings.....                                    | L. & S. V. R. R.....      | 301          |
|                                                | G., C. & S. F. R. R.....  | 33           |
| is.....                                        | I. & G. N. R. R.....      | 141          |
| ond.....                                       | H. & T. C. R. R.....      | 415          |
| burgh.....                                     | Toner.....                | 38           |
| on.....                                        | H. & T. C. R. R.....      | 467          |
| y's.....                                       | I. & G. N. R. R.....      | 120          |
| od.....                                        | G., H. & S. A. R. R.....  | 463          |
|                                                | I. & G. N. R. R.....      | 306          |
| heimer.....                                    | G., C. & S. F. R. R.....  | 546          |
|                                                | Smithsonian Inst.....     | 600          |
| tend.....                                      | H. & T. C. R. R.....      | 245          |
| tta, Signal Station.....                       | U. S. Signal Office.....  | 915          |
|                                                | T. C. R. R.....           | 1,007        |
| ock.....                                       | G., C. & S. F. R. R.....  | 17           |
| m, top of divide above.....                    | G., W. T. & P. R. R.....  | 356          |
| y.....                                         | H. & T. C. R. R.....      | 225          |
| Grove.....                                     | T. & P. R. R.....         | 682          |
|                                                | G., C. & S. F. R. R.....  | 63           |
| n.....                                         | H. & T. C. R. R.....      | 37           |
|                                                | I. & G. N. R. R.....      | 53           |
| d's Spring.....                                | Mex. Boundary Survey..... | 2,054        |
|                                                | H. & T. C. R. R.....      | 859          |
|                                                | H. & T. C. R. R.....      | 281          |
| rd Timbers.....                                | T. & P. R. R.....         | 1,874        |
| Pass.....                                      | P. R. R. Reports.....     | 5,450        |
|                                                | R. R. Surveys.....        | 5,027        |
| Tanks.....                                     | P. R. R. Reports.....     | 3,935        |
| ldt.....                                       | Toner.....                | 867          |

| Station.                                         | Authority.                 | Elevation.          |
|--------------------------------------------------|----------------------------|---------------------|
|                                                  |                            | <i>Feet.</i>        |
| Hurd's Pass .....                                | R. R. Surveys .....        | 4,419               |
| Hutchins .....                                   | H. & T. C. R. R. ....      | 472                 |
| Independence Spring .....                        |                            | 4,778               |
| Indianola, Signal Station .....                  | U. S. Signal Office .....  | 26                  |
| Inge, Fort .....                                 | Med. Dept. U. S. A. ....   | 845                 |
| Iredell .....                                    | T. C. R. R. ....           | 881                 |
| Jackass Prairie .....                            | R. G. R. R. ....           | 19                  |
| Jacksborough, Signal Station .....               | U. S. Signal Office .....  | 1,133               |
| Jacksonville .....                               | I. & G. N. R. R. ....      | 525                 |
| Jefferson, Junction E. L. R. R. ....             | T. & P. R. R. ....         | 221                 |
| Jewett .....                                     | I. & G. N. R. R. ....      | 496                 |
| Junction, I. R. R. with S. A. & M. G. R. R. .... | G. W. T. & P. R. R. ....   | 25                  |
| Kecchi .....                                     | I. & G. N. R. R. ....      | 282                 |
| Kelley's .....                                   | I. & G. N. R. R. ....      | 381                 |
| Kilgore .....                                    | I. & G. N. R. R. ....      | 371                 |
| Kingsbury .....                                  | G., H. & S. A. R. R. ....  | 616                 |
| Kinney .....                                     | G., C. & S. F. R. R. ....  | 399                 |
| Kiowa Peak .....                                 | Petermann .....            | 2,886               |
| Kopperl .....                                    | G., C. & S. F. R. R. ....  | 574                 |
| Kosse .....                                      | H. & T. C. R. R. ....      | 504                 |
| Lake .....                                       | I. & G. N. R. R. ....      | 314                 |
| Lambert .....                                    | T. & P. R. R. ....         | 1,011               |
| Lancaster .....                                  | Med. Dept. U. S. A. ....   | 2,350               |
| Laredo .....                                     | Toner .....                | 806                 |
| Do .....                                         | U. S. Signal Office .....  | 401                 |
| Larissa .....                                    | Smithsonian Inst. ....     | 755                 |
| Lavaca .....                                     | Toner .....                | 17                  |
| Ledbetter .....                                  | H. & T. C. R. R. ....      | 464                 |
| Leon .....                                       | T. C. R. R. ....           | 1,269               |
| Leon Spring .....                                | Mex. Boundary Survey ..... | 2,807               |
| Liberty .....                                    | T. & N. O. R. R. ....      | 48                  |
| Lincoln, Fort .....                              | Med. Dept. U. S. A. ....   | 900                 |
| Lindale .....                                    | I. & G. N. R. R. ....      | 547                 |
| Llano Estacado .....                             |                            | { 3,200<br>to 4,700 |
| Long Point .....                                 | Toner .....                | 400                 |
| Long View, cross. I. & G. N. R. R. at grade ..   | T. & P. R. R. ....         | 336                 |
| Lovelady .....                                   | I. & G. N. R. R. ....      | 300                 |
| Luling .....                                     | G., H. & S. A. R. R. ....  | 418                 |
| Lyons .....                                      | G., C. & S. F. R. R. ....  | 315                 |
| McDade .....                                     | H. & T. C. R. R. ....      | 569                 |
| McIntosh, Fort .....                             | Med. Dept. U. S. A. ....   | 806                 |
| McKavett, Fort .....                             | Med. Dept. U. S. A. ....   | 2,060               |
| Do .....                                         | U. S. Signal Office .....  | 1,217               |
| McKinney .....                                   | H. & T. C. R. R. ....      | 615                 |
| Manor .....                                      | H. & T. C. R. R. ....      | 557                 |
| Marion .....                                     | G., H. & S. A. R. R. ....  | 566                 |
| Marlin Falls .....                               | H. & T. C. R. R. ....      | 394                 |
| Marquez .....                                    | I. & G. N. R. R. ....      | 410                 |
| Marshall, Junction of J. & S. Division .....     | T. & P. R. R. ....         | 371                 |
| Martin Scott, Fort .....                         | Med. Dept. U. S. A. ....   | 1,300               |
| Mason, Fort .....                                | Med. Dept. U. S. A. ....   | 1,300               |
| Mason's Creek .....                              | L. & S. V. R. R. ....      | 241                 |
| Mason, Signal Station .....                      | U. S. Signal Office .....  | 1,620               |
| Medley's .....                                   | I. & G. N. R. R. ....      | 132                 |
| Melissa .....                                    | H. & T. C. R. R. ....      | 692                 |
| Meridian .....                                   | G., C. & S. F. R. R. ....  | 791                 |
| Merrill, Fort .....                              | Med. Dept. U. S. A. ....   | 150                 |
| Mesquite .....                                   | T. & P. R. R. ....         | 484                 |
| Mexia .....                                      | H. & T. C. R. R. ....      | 537                 |
| Milano .....                                     | I. & G. N. R. R. ....      | 475                 |
| Do Junction .....                                | G., C. & S. F. R. R. ....  | 500                 |
| Miller .....                                     | H. & T. C. R. R. ....      | 496                 |
| Millheim .....                                   | G., C. & S. F. R. R. ....  | 169                 |

| Station.                             | Authority.                | Elevation.   |
|--------------------------------------|---------------------------|--------------|
|                                      |                           | <i>Feet.</i> |
| <b>Millican</b> .....                | H. & T. C. R. R. ....     | 300          |
| <b>Mine Creek</b> .....              | Smithsonian Inst. ....    | 600          |
| <b>Mineola</b> .....                 | I. & G. N. R. R. ....     | 402          |
| Do. Junction I. & G. N. R. R. ....   | T. & P. R. R. ....        | 419          |
| <b>Molino</b> .....                  | P. R. R. Reports.....     | 3,830        |
| <b>Mordy</b> .....                   | G., C. & S. F. R. R. .... | 783          |
| <b>Morgan</b> .....                  | T. C. R. R. ....          | 734          |
| <b>Mount Airy</b> .....              | T. C. R. R. ....          | 1,439        |
| <b>Mustang</b> .....                 | G., C. & S. F. R. R. .... | 47           |
| Do. Springs.....                     | Toner.....                | 1,982        |
| <b>Navasota City</b> .....           | H. & T. C. R. R. ....     | 219          |
| <b>Neches</b> .....                  | I. & G. N. R. R. ....     | 411          |
| <b>Neuwied</b> .....                 | Toner.....                | 800          |
| <b>New Boston</b> .....              | T. & P. R. R. ....        | 387          |
| <b>North, Fort</b> .....             | Toner.....                | 1,100        |
| <b>North Franklin Mountain</b> ..... | Wheeler.....              | 7,069        |
| <b>Nueces</b> .....                  | Mex. Boundary Survey..... | 932          |
| <b>Oakwoods</b> .....                | I. & G. N. R. R. ....     | 280          |
| <b>Ojo del Cuerdo</b> .....          | P. R. R. Reports.....     | 3,893        |
| <b>Ojo Escondido</b> .....           | Toner.....                | 2,311        |
| <b>Orange</b> .....                  | T. & N. O. R. R. ....     | 10           |
| <b>Overton</b> .....                 | I. & G. N. R. R. ....     | 507          |
| <b>Oyster Creek</b> .....            | I. & G. N. R. R. ....     | 38           |
| <b>Palge</b> .....                   | H. & T. C. R. R. ....     | 573          |
| <b>Painted Caves</b> .....           | Mex. Boundary Survey..... | 952          |
| <b>Palestine</b> .....               | I. & G. N. R. R. ....     | 495          |
| <b>Palmer</b> .....                  | H. & T. C. R. R. ....     | 471          |
| <b>Paris</b> .....                   | T. & P. R. R. ....        | 592          |
| <b>Peach Creek</b> .....             | Toner.....                | 25.6         |
| <b>Pecos Spring</b> .....            |                           | 3,098        |
| <b>Perry</b> .....                   | H. & T. C. R. R. ....     | 483          |
| <b>Phantom Hill</b> .....            | Med. Dept. U. S. A. ....  | 2,300        |
| <b>Phelps</b> .....                  | I. & G. N. R. R. ....     | 377          |
| <b>Piedro Punta</b> .....            | Toner.....                | 744          |
| <b>Pierce Junction</b> .....         | G., H. & S. A. R. R. .... | 63           |
| <b>Pittsburg</b> .....               | E. L. & R. R. R. R. ....  | 402          |
| <b>Plano</b> .....                   | H. & T. C. R. R. ....     | 667          |
| <b>Point Isabel Depot</b> .....      | R. G. R. R. ....          | 8            |
| <b>Polk, Fort</b> .....              | Toner.....                | 15           |
| <b>Prairie</b> .....                 | I. & G. N. R. R. ....     | 87           |
| <b>Presidio del Norte</b> .....      |                           | 2,779        |
| <b>Preston</b> .....                 | P. R. R. Reports.....     | 790          |
| <b>Price's Creek</b> .....           | G., W. T. & P. R. R. .... | 105          |
| <b>Quarry</b> .....                  | G., C. & S. F. R. R. .... | 235          |
| <b>Quihi</b> .....                   | Mex. Boundary Survey..... | 856          |
| <b>Quitman, Fort</b> .....           | Med. Dept. U. S. A. ....  | 3,710        |
| <b>Random</b> .....                  | Toner.....                | 147          |
| <b>Randon</b> .....                  | G., H. & S. A. R. R. .... | 93           |
| <b>Ranger</b> .....                  | T. & P. R. R. ....        | 1,294        |
| <b>Reagan Falls</b> .....            | H. & T. C. R. R. ....     | 385          |
| <b>Red Branch</b> .....              | I. & G. N. R. R. ....     | 226          |
| <b>Red Gap</b> .....                 | T. & P. R. R. ....        | 1,539        |
| <b>Red River City</b> .....          | Toner.....                | 572          |
| <b>Resaca de la Palma</b> .....      | R. G. R. R. ....          | 27           |
| <b>Rice</b> .....                    | H. & T. C. R. R. ....     | 473          |
| <b>Richardson</b> .....              | H. & T. C. R. R. ....     | 643          |
| <b>Richland</b> .....                | H. & T. C. R. R. ....     | 377          |
| <b>Richmond</b> .....                | G., H. & S. A. R. R. .... | 73           |
| Do.....                              | G., C. & S. F. R. R. .... | 105          |
| <b>Ringgold Barracks</b> .....       | Med. Dep., U. S. A. ....  | 521          |
| <b>Riverside</b> .....               | I. & G. N. R. R. ....     | 169          |
| <b>Robinson's</b> .....              | L. & S. V. R. R. ....     | 256          |
| <b>Rockdale</b> .....                | I. & G. N. R. R. ....     | 469          |

| Station.                                          | Authority.                   | Elevat |
|---------------------------------------------------|------------------------------|--------|
| Roger's .....                                     | G., C. & S. F. R. R. ....    | 1      |
| Rosenberg Junction .....                          | G., C. & S. F. R. R. ....    |        |
| Ross .....                                        | H. & T. C. R. R. ....        |        |
| Round Rock .....                                  | I. & G. N. R. R. ....        |        |
| San Antonio .....                                 | G., H. & S. A. R. R. ....    |        |
| Do .....                                          | U. S. Signal Office .....    |        |
| Sandy Point .....                                 | I. & G. N. R. R. ....        |        |
| San Elciario .....                                | Mex. Boundary Survey .....   | 3      |
| San Felipe .....                                  | Mex. Boundary Survey .....   |        |
| Schulenburg .....                                 | G., H. & S. A. R. R. ....    |        |
| Sealy .....                                       | G., C. & S. F. R. R. ....    |        |
| Seco .....                                        | Toner .....                  |        |
| Sequin .....                                      | G., H. & S. A. R. R. ....    |        |
| Shelden .....                                     | T. & N. O. R. R. ....        |        |
| Sherman, crossing H. & T. C. R. R. at grade ..... | T. & P. R. R. ....           |        |
| Signal Staff .....                                | R. G. R. R. ....             |        |
| Sisterdale .....                                  | Smithsonian Inst .....       | 1      |
| Sour Lake .....                                   | T. & N. O. R. R. ....        |        |
| Spring .....                                      | I. & G. N. R. R. ....        |        |
| Springfield .....                                 | Smithsonian Inst .....       | 4      |
| Stockton, Fort, Signal Station .....              | U. S. Signal Office .....    | 3      |
| Stork's .....                                     | I. & G. N. R. R. ....        |        |
| Sulphur Springs .....                             | E. L. & R. R. R. R. ....     |        |
| Summit Ridge .....                                | H. & T. C. R. R. ....        |        |
| Sutton .....                                      | H. & T. C. R. R. ....        |        |
| Tehuacana .....                                   | Toner .....                  |        |
| Temple Junction .....                             | G., C. & S. F. R. R. ....    |        |
| Terrell .....                                     | T. & P. R. R. ....           |        |
| Terrett, Fort .....                               | Med. Dep. U. S. A. ....      | 1      |
| Terry .....                                       | T. & N. O. R. R. ....        |        |
| Thompson .....                                    | G., C. & S. F. R. R. ....    |        |
| Do .....                                          | H. & T. C. R. R. ....        |        |
| Thornton .....                                    | H. & T. C. R. R. ....        |        |
| Tinge .....                                       | Toner .....                  |        |
| Trinity .....                                     | I. & G. N. R. R. ....        |        |
| Troupe .....                                      | I. & G. N. R. R. ....        |        |
| Twin Butte Gap .....                              | T. & P. R. R. ....           | 1      |
| Tyler .....                                       | I. & G. N. R. R. ....        |        |
| Union Hill .....                                  | Med. Dept. U. S. A. ....     |        |
| Upton .....                                       | G., H. & S. A. R. R. ....    |        |
| Uvaldo, Signal Station .....                      | U. S. Signal Office .....    |        |
| Valley Mills .....                                | G. C. & S. F. R. R. ....     |        |
| Van Alstyne .....                                 | H. & T. C. R. R. ....        |        |
| Verde, Camp .....                                 | Med. Dept. U. S. A. ....     | 1      |
| Victoria Depot .....                              | G., W. T. & P. R. R. ....    |        |
| Virginia Point .....                              | G., C. & S. F. R. R. ....    |        |
| Wailder .....                                     | G., H. & S. A. R. R. ....    |        |
| Waller Waller .....                               | H. & T. C. R. R. ....        |        |
| Wallis .....                                      | G., C. & S. F. R. R. ....    |        |
| Walnut Springs .....                              | T. C. R. R. ....             |        |
| Washington .....                                  | Smithsonian Inst .....       |        |
| Waverly .....                                     | I. & G. N. R. R. ....        |        |
| Weatherford .....                                 | T. & P. R. R. ....           |        |
| Webberville, Parson's Seminary .....              | Smithsonian Inst .....       |        |
| Weimar .....                                      | G., H. & S. A. R. R. ....    |        |
| Wellborn .....                                    | H. & T. C. R. R. ....        |        |
| West Bernard .....                                | G., H. & S. A. R. R. ....    |        |
| West Creek .....                                  | G. W. T. & P. R. R. ....     |        |
| Westfield .....                                   | I. & G. N. R. R. ....        |        |
| Wheelock .....                                    | Smithsonian Inst .....       |        |
| White Cloud .....                                 | Toner .....                  |        |
| Whitehouse .....                                  | I. & G. N. R. R. ....        |        |
| Whitewright .....                                 | Mo., Kans. & Tex. R. R. .... |        |

| Station.             | Authority.                | Elevation.   |
|----------------------|---------------------------|--------------|
|                      |                           | <i>Feet.</i> |
| Whitney .....        | T. C. R. R. ....          | 586          |
| Wilkins .....        | L. & S. V. R. R. ....     | 271          |
| Willis .....         | I. & G. N. R. R. ....     | 381          |
| Wills' Point .....   | T. & P. R. R. ....        | 530          |
| Winsborough .....    | E. L. & R. R. R. R. ....  | 532          |
| Wortham .....        | H. & T. C. R. R. ....     | 482          |
| Worth, Fort .....    | Toner .....               | 629          |
| Yellow Prairie ..... | G., C. & S. F. R. R. .... | 458          |

(413)

Bull. 5—19



# UTAH.

| Station.                                | Authority.               | Elevation.   |
|-----------------------------------------|--------------------------|--------------|
|                                         |                          | <i>Feet.</i> |
| Adairville .....                        | Powell .....             | 4,400        |
| Adam's Head .....                       | Powell .....             | 10,360       |
| Adamsville .....                        | Wheeler .....            | 5,600        |
| Akanauquint .....                       | P. R. R. Reports .....   | 4,457        |
| Alice, Mount .....                      | Powell .....             | 9,540        |
| Alum Beds .....                         | D. & R. G. R. R. ....    | 5,907        |
| Ambey .....                             | C. P. R. R. ....         | 4,721        |
| American Fork .....                     | U. C. R. R. ....         | 4,554        |
| Do .....                                | P. R. R. Reports .....   | 4,596        |
| Do .....                                | Wheeler .....            | 4,578        |
| Do .....                                | Powell .....             | 4,580        |
| Do .....                                | U. S. R. R. ....         | 4,608        |
| Anderson Peak .....                     | Powell .....             | 10,710       |
| Antelope Island .....                   | Wheeler .....            | 6,660        |
| Antelope Peak .....                     | Powell .....             | 7,100        |
| Antelope Spring .....                   | Powell .....             | 5,390        |
| Do .....                                | Wheeler .....            | 5,850        |
| Do .....                                | Wheeler .....            | 6,702        |
| Do .....                                | Wheeler .....            | 7,144        |
| Do .....                                | (upper) .....            | 7,144        |
| Aquarius Plateau .....                  | Powell .....             | { 10,000     |
|                                         |                          | { 11,000     |
| Aspen Lake .....                        | Powell .....             | 8,927        |
| Atkinson .....                          | Summit County R. R. .... | 6,462        |
| Averitt Spring .....                    | Summit County R. R. .... | 8,580        |
| Awapa Plateau .....                     | Powell .....             | { 8,000      |
|                                         |                          | { 10,000     |
| Bald Head .....                         | Powell .....             | 9,643        |
| Bald Mountain .....                     | Powell .....             | 8,430        |
| Bald Mountains .....                    | King .....               | 11,975       |
| Baldy Peak .....                        | Wheeler .....            | 11,730       |
| Bangs, Mount .....                      | Powell .....             | 7,950        |
| Bare Bush Point (Wasatch Plateau) ..... | Powell .....             | 10,250       |
| Bartels, Mount .....                    | Powell .....             | 10,050       |
| Barton Mountain .....                   | Wheeler .....            | 9,854        |
| Bean Spring .....                       | Powell .....             | 9,230        |
| Bear Lake .....                         | Hayden .....             | 5,911        |
| Bear River Bridge .....                 | Wheeler .....            | 4,197        |
| Bear Valley .....                       | Wheeler .....            | 7,071        |
| Do .....                                | Powell .....             | { 6,600      |
|                                         |                          | { 7,200      |
| Beaver .....                            | Powell .....             | 5,970        |
| Do astronomical station .....           | Wheeler .....            | 5,916        |
| Beaver Dam Mountains .....              | Powell .....             | 8,100        |
| Beaver Valley .....                     | D. & R. G. R. R. ....    | 4,886        |
| Bechler, Mount .....                    | Hayden .....             | 9,716        |
| Belknap, Mount .....                    | Powell .....             | 12,300       |
| Do .....                                | Wheeler .....            | 11,894       |
| Berry's Springs .....                   | Wheeler .....            | 2,810        |
| Big Cottonwood .....                    | U. S. R. R. ....         | 4,261        |
| Big Dam Springs .....                   | Wheeler .....            | 4,317        |
| Big Narrows .....                       | D. & R. G. R. R. ....    | 6,020        |
| Big Springs .....                       | D. & R. G. R. R. ....    | 4,234        |
| Black Cap Butte .....                   | Powell .....             | 6,530        |
| Black Rock .....                        | U. W. R. R. ....         | 4,263        |
| Do .....                                | U. C. R. R. ....         | 4,799        |
| Do bench-mark .....                     | U. S. Geol. Survey ..... | 4,250        |
| Blacktail Peak .....                    | King .....               | 9,943        |
| Blue Creek .....                        | C. P. R. R. ....         | 4,379        |

| Station.                         | Authority.                | Elevation.   |
|----------------------------------|---------------------------|--------------|
|                                  |                           | <i>Feet.</i> |
| Blue Gate Mesa .....             | Powell .....              | 5,900        |
| Blue Gate Plateau, north .....   | Powell .....              | 6,800        |
| Do.....south .....               | Powell .....              | { 6,800      |
|                                  |                           | { 7,300      |
| Blue Mountain.....               | Powell .....              | 11,071       |
| Blue Spring.....                 | Wheeler .....             | 7,131        |
| Bonneville.....                  |                           | 4,310        |
| Bovine .....                     | C. P. R. R. ....          | 4,347        |
| Bowl Valley .....                | Powell .....              | { 7,600      |
|                                  |                           | { 7,700      |
| Box Elder Peak .....             | Wheeler .....             | 9,542        |
| Bingham Junction .....           | D. & R. G. R. R. ....     | 4,366        |
| Brian, Mount.....                | Powell .....              | 11,178       |
| Brian's Head.....                | Powell .....              | 11,260       |
| Brigham City .....               | C. P. R. R. ....          | 4,226        |
| Do .....                         | U. & N. R. R. ....        | 4,321        |
| Do .....                         | Wheeler .....             | 4,476        |
| Brown's Park .....               | Powell .....              | { 5,500      |
|                                  |                           | { 5,800      |
| Brown's Peak .....               | Powell .....              | 5,392        |
| Bruin Point.....                 | Powell .....              | 10,150       |
| Buckhorn Flats .....             | D. & R. G. R. R. ....     | 5,697        |
| Buckhorn Junction .....          | D. & R. G. R. R. ....     | 5,692        |
| Buck Horn Spring.....            | Powell .....              | 5,770        |
| Buckhorn Spring.....             | Wheeler .....             | 5,688        |
| Bullionville Road Crossing ..... | D. & R. G. R. R. ....     | 5,548        |
| Burro Peak .....                 | King.....                 | 12,834       |
| Cachill .....                    | U. & N. R. R. ....        | 4,971        |
| Call's Fort .....                | U. & N. R. R. ....        | 4,255        |
| Cameron, Fort .....              | Wheeler .....             | 6,058        |
| Camp Floyd Pass .....            | Simpson .....             | 5,234        |
| Carmel, Mount .....              | Powell .....              | 5,241        |
| Castle Gate .....                | D. & R. G. R. R. ....     | 6,322        |
| Castle Rock.....                 | U. P. R. R. ....          | 6,249        |
| Castle Valley .....              | Powell .....              | { 5,000      |
|                                  |                           | { 6,500      |
| Castle Valley Junction .....     | D. & R. G. R. R. ....     | 5,795        |
| Cedar City.....                  | Wheeler .....             | 5,726        |
| Cedar Mountain Pass.....         | P. R. R. Reports .....    | 6,364        |
| Cedar Ridge Summit .....         | D. & R. G. R. R. ....     | 6,228        |
| Cedar Spring .....               | Wheeler .....             | 5,100        |
| Cedar Summit .....               | D. & R. G. R. R. ....     | 4,984        |
| Cedar Valley.....                | Powell .....              | { 5,300      |
|                                  |                           | { 6,000      |
| Centerville .....                | U. C. R. R. ....          | 4,253        |
| Cherry Creek .....               | D. & R. G. R. R. ....     | 5,299        |
| Circle Valley.....               | D. & R. G. R. R. ....     | 6,055        |
| Do .....                         | Powell .....              | { 6,000      |
|                                  |                           | { 6,300      |
| Circleville .....                | Wheeler .....             | 5,624        |
| City of Rocks .....              | Wheeler .....             | 6,078        |
| Clarkson .....                   | Hayden .....              | 4,800        |
| Clarkston .....                  | Powell .....              | 5,930        |
| Clayton's Peak.....              | King.....                 | 11,889       |
| Clear Creek .....                | D. & R. G. R. R. ....     | 6,229        |
| Clear Creek Mountain.....        | Wheeler .....             | 9,132        |
| Coal Point .....                 | Powell .....              | 6,760        |
| Coalville .....                  | Summit Co. R. R. ....     | 5,596        |
| Colob Plateau.....               | Powell .....              | { 8,000      |
|                                  |                           | { 9,000      |
| Copenhagen .....                 | Hayden .....              | 4,999        |
| Corinne.....                     | C. P. R. R. ....          | 4,232        |
| Do signal station .....          | U. S. Signal Office ..... | 4,249        |
| Corn Creek Settlement .....      | Powell .....              | 4,800        |

| Station.                                  | Authority.                  | Elevation.   |
|-------------------------------------------|-----------------------------|--------------|
|                                           |                             | <i>Feet.</i> |
| Carson Peak .....                         | King .....                  | 9,630        |
| Cottonwood .....                          | .....                       | 4,200        |
| Cottonwood Springs .....                  | D. & R. G. R. R. ....       | 4,661        |
| Coushare .....                            | Powell .....                | 6,850        |
| Cove Creek Fort .....                     | Powell .....                | 6,000        |
| Cove Fort Junction .....                  | D. & R. G. R. R. ....       | 5,477        |
| Cox Peak .....                            | .....                       | 13,250       |
| Craggy Head .....                         | Powell .....                | 8,250        |
| Crescent Gap .....                        | D. & R. G. R. R. ....       | 4,720        |
| Crittenden, Fort .....                    | Toner .....                 | 4,860        |
| Croyden .....                             | U. P. R. R. ....            | 5,250        |
| Cub River Bridge .....                    | .....                       | 4,542        |
| Culmination Point .....                   | Powell .....                | 9,700        |
| Curlew .....                              | Wheeler .....               | 4,397        |
| Dalton, Mount. ....                       | Powell .....                | 10,480       |
| Danishtown .....                          | Wheeler .....               | 4,400        |
| Deadman's Springs .....                   | .....                       | 6,782        |
| Deep Creek .....                          | D. & R. G. R. R. ....       | 5,025        |
| Do .....                                  | Wheeler .....               | 5,237        |
| Do .....                                  | King .....                  | 5,127        |
| Delano, Mount. ....                       | Powell .....                | 12,240       |
| Dellenbaugh, Mount. ....                  | Powell .....                | 6,650        |
| Deeriet .....                             | U. C. R. R. ....            | 4,541        |
| Do .....                                  | Wheeler .....               | 4,642        |
| Desert Mountain .....                     | Wheeler .....               | 8,175        |
| Desert Spring .....                       | Wheeler .....               | 5,887        |
| Desert Springs .....                      | Powell .....                | 5,610        |
| Deweyville .....                          | U. & N. R. R. ....          | 4,328        |
| Do .....                                  | Wheeler .....               | 4,415        |
| Diamond City .....                        | Wheeler .....               | 6,309        |
| Diamond Valley .....                      | Powell .....                | { 4,300      |
|                                           |                             | { 4,800      |
| Dilley's Ranch, Hansel Spring .....       | Wheeler .....               | 5,043        |
| Dodoquiba Spring .....                    | P. R. R. Reports .....      | 4,659        |
| Douglas, Camp .....                       | Wheeler .....               | 5,024        |
| Do .....                                  | astronom. mont. by level .. | 4,905        |
| Draper .....                              | U. C. R. R. ....            | 4,443        |
| Do .....                                  | U. S. R. R. ....            | 4,513        |
| East Fork Sevier .....                    | D. & R. G. R. R. ....       | 7,714        |
| East Salient .....                        | Powell .....                | 7,490        |
| East Tavaputs Plateau .....               | Powell .....                | { 5,500      |
|                                           |                             | { 9,700      |
| Echo .....                                | U. P. R. R. ....            | 5,480        |
| Echo Park (mouth Yampa River) .....       | Powell .....                | 5,080        |
| Ellen, Mount. ....                        | Powell .....                | 11,410       |
| Ellenore, Mount. ....                     | Powell .....                | 7,680        |
| Ellen Spring .....                        | Powell .....                | 9,940        |
| Ellsworth, Mount .....                    | Powell .....                | 8,150        |
| El Vado de los Padres (Colorado River) .. | Wheeler .....               | 3,194        |
| Do .....                                  | Powell .....                | 3,220        |
| Emma's Park .....                         | Powell .....                | 7,370        |
| Emmons, Mount. ....                       | King .....                  | 13,694       |
| Ephraim .....                             | Wheeler .....               | 5,633        |
| Ephraim Point .....                       | Powell .....                | 8,690        |
| Epley Butte .....                         | Powell .....                | 5,860        |
| Escalante City .....                      | Powell .....                | 5,700        |
| Escalante Desert .....                    | Powell .....                | { 5,000      |
|                                           |                             | { 5,500      |
| E. T. City .....                          | D. & R. G. R. R. ....       | 4,272        |
| Eureka City .....                         | Wheeler .....               | 6,400        |
| Eyrie Peak .....                          | Wheeler .....               | 9,453        |
| Fairfield .....                           | Wheeler .....               | 4,863        |
| Farmington .....                          | U. C. R. R. ....            | 4,261        |
| Faust .....                               | Wheeler .....               | 5,296        |

| Station.                                       | Authority.                    | Elevation.         |
|------------------------------------------------|-------------------------------|--------------------|
|                                                |                               | <i>Feet.</i>       |
| <b>Fillmore</b> .....                          | Wheeler .....                 | 6,025              |
| Do .....                                       | Powell .....                  | 5,100              |
| <b>Fish Lake</b> .....                         | Powell .....                  | 8,790              |
| <b>Fish Lake Mountain</b> .....                | Powell .....                  | 11,578             |
| <b>Fish Lake</b> .....                         | Wheeler .....                 | 8,763              |
| Do .....                                       | Powell .....                  | 8,792              |
| <b>Fish Lake Plateau</b> .....                 | Powell .....                  | { 10,500<br>11,600 |
| <b>Fish Lake Valley</b> .....                  | Powell .....                  | { 8,750<br>8,850   |
| <b>Fish Spring</b> .....                       | Wheeler .....                 | 6,269              |
| <b>Flaming Gorge</b> .....                     | Powell .....                  | 5,920              |
| <b>Floyd, Camp (now Fairfield)</b> .....       | Med. Dept., U. S. A. ....     | 4,860              |
| Do .....                                       | Wheeler .....                 | 4,867              |
| <b>Fountain Green</b> .....                    | Wheeler .....                 | 6,874              |
| <b>Frances Point</b> .....                     | Powell .....                  | 10,430             |
| <b>Frisco</b> .....                            | U. C. R. R. ....              | 6,315              |
| <b>Germania</b> .....                          | D. & R. G. R. R. ....         | 4,296              |
| Do .....                                       | U. C. R. R. ....              | 4,242              |
| <b>Gilbert's Peak</b> .....                    | King .....                    | 13,687             |
| Do .....                                       | King .....                    | 11,100             |
| <b>Glencoe</b> .....                           | Wheeler .....                 | 5,221              |
| Do .....                                       | Powell .....                  | 5,237              |
| <b>Glenwood</b> .....                          | Powell .....                  | 5,300              |
| <b>Goshen</b> .....                            | Powell .....                  | 4,492              |
| <b>Gooseberry Valley (south end)</b> .....     | Powell .....                  | { 8,600<br>8,700   |
| <b>Gould's Ranch</b> .....                     | Powell .....                  | 4,052              |
| <b>Granite Rock</b> .....                      | D. & R. G. R. R. ....         | 4,356              |
| <b>Grantville</b> .....                        | D. & R. G. R. R. ....         | 4,251              |
| <b>Grass Creek Junction</b> .....              | Summit Co. R. R. ....         | 5,520              |
| <b>Grass Valley</b> .....                      | Powell .....                  | { 6,200<br>7,500   |
| Do .....                                       | Wheeler .....                 | 6,857              |
| <b>Graves Valley</b> .....                     | Powell .....                  | 4,300              |
| <b>Gray Head</b> .....                         | Powell .....                  | 9,640              |
| <b>Great Sage Plain (mean elevation)</b> ..... | Hayden .....                  | 6,500              |
| <b>Great Salt Lake (May 16, 1873)</b> .....    | U. S. Geological Survey ..... | 4,218              |
| <b>Green River</b> .....                       | D. & R. G. R. R. ....         | 4,021              |
| <b>Gunnison</b> .....                          | Powell .....                  | 5,118              |
| Do .....                                       | Wheeler .....                 | 5,144              |
| Do .....                                       | Powell .....                  | 5,120              |
| <b>Gunnison</b> .....                          | Powell .....                  | 5,134              |
| <b>Gunnison's Crossing (Green River)</b> ..... | Powell .....                  | 4,083              |
| <b>Gunnison Plateau</b> .....                  | Powell .....                  | { 7,000<br>9,800   |
| Do .....                                       | Powell .....                  | 9,864              |
| <b>Gunnison Point</b> .....                    | Powell .....                  | 6,000              |
| <b>Gunnison Valley</b> .....                   | Powell .....                  | { 4,100<br>4,500   |
| <b>Gunsight Mountain</b> .....                 | Hayden .....                  | 8,306              |
| <b>Hague Spring</b> .....                      | Powell .....                  | 5,450              |
| <b>Half-way House</b> .....                    | U. W. R. R. ....              | 4,326              |
| <b>Hampton's Bridge</b> .....                  | Hayden .....                  | 4,300              |
| Do .....                                       | Wheeler .....                 | 4,700              |
| <b>Hanging Rock</b> .....                      | Toner .....                   | 5,974              |
| <b>Hansel Pass</b> .....                       | Wheeler .....                 | 5,138              |
| <b>Hardy's</b> .....                           | D. & R. G. R. R. ....         | 5,437              |
| <b>Harry, Mount</b> .....                      | Powell .....                  | 11,300             |
| <b>Hawawah Spring</b> .....                    | Wheeler .....                 | 5,455              |
| <b>Hay Patch Spring</b> .....                  | Wheeler .....                 | 5,590              |
| <b>Hay Spring</b> .....                        | Wheeler .....                 | 5,092              |
| <b>Heber Mountain</b> .....                    | King .....                    | 10,138             |
| Do .....                                       | Powell .....                  | 9,850              |

| Station.                             | Authority.            | Elevation.   |
|--------------------------------------|-----------------------|--------------|
|                                      |                       | <i>Feet.</i> |
| Hebron .....                         | Powell .....          | 5,450        |
| Do .....                             | Wheeler .....         | 5,474        |
| Hell's Kitchen .....                 | Powell .....          | 7,641        |
| Hensell's Spring .....               | .....                 | 5,373        |
| Hildreth's Ranch .....               | Wheeler .....         | 4,308        |
| Hilgard, Mount .....                 | Powell .....          | 11,460       |
| Hillers, Mount .....                 | Powell .....          | 10,650       |
| Hodges, Mount .....                  | King .....            | 13,500       |
| Holden .....                         | Powell .....          | 5,050        |
| Holmes, Mount .....                  | Powell .....          | 7,930        |
| Hooper's Ranch, Skull Valley .....   | Wheeler .....         | 4,365        |
| Horeb, Mount .....                   | King .....            | 7,831        |
| Horn Head .....                      | Powell .....          | 10,920       |
| Hornsilver .....                     | D. & R. G. R. R. .... | 4,291        |
| Horn Silver Mine .....               | U. C. R. R. ....      | 6,449        |
| Hot Springs .....                    | U. & N. R. R. ....    | 4,281        |
| Hyde Park .....                      | Hayden .....          | 4,500        |
| Do .....                             | Wheeler .....         | 4,412        |
| Indian Head (Tavaputs Plateau) ..... | Powell .....          | 9,810        |
| Indian Spring .....                  | Wheeler .....         | 5,234        |
| Iron City .....                      | Wheeler .....         | 6,099        |
| Iron Spring .....                    | Powell .....          | 5,420        |
| Island Park .....                    | Powell .....          | 5,000        |
| Jackson's Mills .....                | Wheeler .....         | 5,150        |
| Jennings Springs .....               | D. & R. G. R. R. .... | 4,695        |
| Joe's Valley .....                   | Powell .....          | 7,000        |
| Do .....                             | .....                 | 9,000        |
| Do .....                             | Wheeler .....         | 8,420        |
| Johnson's Pass .....                 | Whitney .....         | 6,237        |
| Johnson Spring .....                 | Powell .....          | 5,470        |
| Juab .....                           | U. C. R. R. ....      | 5,019        |
| Juab Valley .....                    | Powell .....          | 5,000        |
| .....                                | .....                 | 6,000        |
| .....                                | .....                 | 6,000        |
| Kaibab Plateau .....                 | Powell .....          | 8,000        |
| Kaiparowits Peak .....               | Powell .....          | 9,180        |
| Kaiparowits Plateau .....            | Powell .....          | 6,000        |
| Do .....                             | .....                 | 7,500        |
| Do .....                             | .....                 | 7,489        |
| Kanab .....                          | Wheeler .....         | 5,072        |
| Do .....                             | .....                 | 4,925        |
| Do .....                             | .....                 | 4,917        |
| Do .....                             | .....                 | 4,947        |
| Kanab Plateau .....                  | .....                 | 7,000        |
| Kanab Springs .....                  | Powell .....          | 5,310        |
| Kanara .....                         | Powell .....          | 5,450        |
| Do .....                             | Wheeler .....         | 5,419        |
| Kansas .....                         | .....                 | 6,304        |
| Kansas Prairie .....                 | Simpson .....         | 6,242        |
| Do .....                             | Wheeler .....         | 6,225        |
| Katharine's Peak .....               | Powell .....          | 9,902        |
| Kaysville .....                      | U. C. R. R. ....      | 4,298        |
| Kelton .....                         | C. P. R. R. ....      | 4,223        |
| Do .....                             | Wheeler .....         | 4,222        |
| Key .....                            | D. & R. G. R. R. .... | 4,243        |
| Kimball's .....                      | D. & R. G. R. R. .... | 6,336        |
| Kimball, Mount .....                 | Wheeler .....         | 7,777        |
| King's Meadows .....                 | Powell .....          | 5,500        |
| Knowlton .....                       | D. & R. G. R. R. .... | 4,323        |
| Lake .....                           | .....                 | 4,223        |
| Lake Butte, near Laketown .....      | Wheeler .....         | 6,345        |
| Lake Range (highest peak) .....      | Powell .....          | 7,422        |

| Station.                                    | Authority.             | Elevation.   |
|---------------------------------------------|------------------------|--------------|
|                                             |                        | <i>Feet.</i> |
| <b>Laketown</b> .....                       | Hayden .....           | 6,000        |
| Do.... Walstrom's shop .....                | Wheeler .....          | 5,993        |
| <b>Lake View Peak</b> .....                 | Hayden .....           | 7,795        |
| <b>La Motte Peak</b> .....                  | King .....             | 12,892       |
| <b>Leeds</b> .....                          | Powell .....           | 3,400        |
| <b>Lee's Springs, in Fremont Pass</b> ..... | Wheeler .....          | 6,883        |
| <b>Lehi</b> .....                           | U. C. R. R. .....      | 4,517        |
| Do .....                                    | U. S. R. R. .....      | 4,586        |
| Do .....                                    | Wheeler .....          | 4,596        |
| Do .....                                    | D. & R. G. R. R. ..... | 4,544        |
| <b>Lemington</b> .....                      | U. C. R. R. .....      | 4,674        |
| <b>Leonora Peak</b> .....                   | Powell .....           | 8,900        |
| <b>Lewiston Peak</b> .....                  | Wheeler .....          | 10,623       |
| <b>Lime Pass</b> .....                      | King .....             | 10,740       |
| <b>Little Bitter Creek Springs</b> .....    | Powell .....           | 6,658        |
| <b>Little Cottonwood</b> .....              | U. S. R. R. .....      | 4,288        |
| Do....do .....                              | Wheeler .....          | 4,359        |
| <b>Little Creek Peak</b> .....              | Powell .....           | 10,010       |
| <b>Little's Ranch</b> .....                 | Powell .....           | 7,000        |
| <b>Logan</b> .....                          | Hayden .....           | 4,509        |
| Do .....                                    | U. & N. R. R. .....    | 4,507        |
| Do .....                                    | Wheeler .....          | 4,533        |
| <b>Logan Peak</b> .....                     | Hayden .....           | 10,004       |
| Do..do .....                                | Powell .....           | 7,950        |
| <b>Lone Peak</b> .....                      | King .....             | 11,295       |
| <b>Lone Rock Valley</b> .....               | P. R. R. Reports ..... | { 4,400      |
|                                             |                        | { 5,400      |
|                                             |                        | { 5,000      |
| <b>Long Valley</b> .....                    | Powell .....           | { 6,000      |
|                                             |                        | { 5,500      |
| <b>Lost Creek Valley</b> .....              | Powell .....           | { 6,000      |
| <b>Lovendahls</b> .....                     | U. C. R. R. .....      | 4,277        |
| <b>Lucin</b> .....                          | C. P. R. R. .....      | 4,498        |
| <b>McCready's Meadow</b> .....              | Powell .....           | 6,240        |
| <b>Mammoth Mill</b> .....                   | Wheeler .....          | 6,947        |
| <b>Mansard Point</b> .....                  | Powell .....           | 6,290        |
|                                             |                        | { 8,000      |
| <b>Markagunt Plateau</b> .....              | Powell .....           | { 11,000     |
| <b>Maroni Peak</b> .....                    | Powell .....           | 8,010        |
| <b>Marsh's Peak</b> .....                   | King .....             | 12,410       |
| <b>Marvine, Mount</b> .....                 | Powell .....           | 11,600       |
| <b>Marysvale</b> .....                      | D. & R. G. R. R. ..... | 5,808        |
| Do .....                                    | Powell .....           | 5,810        |
| <b>Marysvale Peak</b> .....                 | Powell .....           | 10,359       |
|                                             |                        | { 7,700      |
| <b>Masuk Plateau</b> .....                  | Powell .....           | { 8,200      |
| <b>Matlin</b> .....                         | C. P. R. R. .....      | 4,597        |
| <b>Meadow Creek</b> .....                   | Wheeler .....          | 5,992        |
| <b>Meadowville</b> .....                    | Hayden .....           | 6,200        |
| <b>Mendon</b> .....                         | U. & N. R. R. .....    | 4,459        |
| Do .....                                    | Wheeler .....          | 4,553        |
| <b>Midget Crest</b> .....                   | Powell .....           | 11,414       |
| <b>Milford</b> .....                        | U. C. R. R. .....      | 4,908        |
| <b>Mill Creek Station</b> .....             | Wheeler .....          | 6,504        |
| <b>Miller Creek</b> .....                   | D. & R. G. R. R. ..... | 5,505        |
| <b>Mill Fork</b> .....                      | D. & R. G. R. R. ..... | 5,791        |
| <b>Mills</b> .....                          | U. C. R. R. .....      | 4,852        |
| <b>Mill Spring</b> .....                    |                        | 6,504        |
| <b>Mill Station</b> .....                   | Wheeler .....          | 6,504        |
| <b>Mona</b> .....                           | U. C. R. R. .....      | 4,859        |
| Do .....                                    | Powell .....           | 4,900        |
| <b>Monroe</b> .....                         | Powell .....           | 5,380        |
| <b>Monroe Peak</b> .....                    | Powell .....           | 11,240       |
| <b>Montpellier</b> .....                    | Hayden .....           | 5,793        |

| Station.                                   | Authority.             | Elevation.   |
|--------------------------------------------|------------------------|--------------|
|                                            |                        | <i>Feet.</i> |
| Monument .....                             | C. P. R. R. ....       | 4,227        |
| Moraine Valley .....                       | Powell .....           | { 9,000      |
|                                            |                        | { 10,000     |
| Morgan .....                               | U. C. R. R. ....       | 4,220        |
| Moses, Mount .....                         | Wheeler .....          | 8,725        |
| Mounds House .....                         | Powell .....           | 4,940        |
| Mountain City .....                        | Powell .....           | 5,760        |
| Mountain Meadow .....                      | Wheeler .....          | 5,741        |
| Mountain Spring .....                      | Powell .....           | 5,741        |
| Mount Carmel .....                         | Powell .....           | 5,250        |
| Mount Pleasant .....                       | Wheeler .....          | 5,875        |
| Do .....                                   | Powell .....           | 5,900        |
| Musinia Peak .....                         | Powell .....           | 10,940       |
| Naomi Peak .....                           | Wheeler .....          | 9,951        |
| Narrows .....                              | D. & R. G. R. R. ....  | 4,498        |
| Navajo Well Point .....                    | Powell .....           | 6,460        |
| Nebo, Mount .....                          | Wheeler .....          | 11,992       |
| Do .....                                   | Powell .....           | 11,680       |
| Neels .....                                | U. C. R. R. ....       | 4,356        |
| Nephi .....                                | Powell .....           | 5,130        |
| Do .....                                   | U. C. R. R. ....       | 5,056        |
| Do .....                                   | P. R. R. Reports ..... | 4,938        |
| Do .....                                   | Wheeler .....          | 4,920        |
| Newfoundland Mountain .....                | Wheeler .....          | 7,045        |
| New Point .....                            | Powell .....           | 5,120        |
| Nomansville Summit .....                   | D. & R. G. R. R. ....  | 6,605        |
| North Logan Peak .....                     | Hayden .....           | 10,004       |
| North Ogden .....                          | Wheeler .....          | 4,509        |
| North Ogden Mountain .....                 | Wheeler .....          | 9,695        |
| North Promontory Peak .....                | Wheeler .....          | 7,134        |
| North Willard .....                        | Wheeler .....          | 4,276        |
| Oak Creek .....                            | Wheeler .....          | 5,158        |
| Oak Pass .....                             | Simpson .....          | 7,200        |
| Oak Springs .....                          |                        | 6,790        |
| Observatory Peak .....                     | Wheeler .....          | 9,589        |
| Odoriferous Spring .....                   | Powell .....           | 6,610        |
| Ogden, junc. with U. P. & U. C. R. R. .... | C. P. R. R. ....       | 4,303        |
| Do .....                                   | Wheeler .....          | 4,374        |
| Pahrea Summit .....                        | D. & R. G. R. R. ....  | 7,731        |
| Panguitch .....                            | Wheeler .....          | 6,273        |
| Do .....                                   | Powell .....           | 6,560        |
| Panguitch Lake .....                       | Powell .....           | 8,130        |
| Panguitch Hayfields .....                  | Powell .....           | { 7,000      |
|                                            |                        | { to 7,500   |
| Paradise .....                             | Wheeler .....          | 4,863        |
| Paragoonah .....                           | Wheeler .....          | 6,228        |
| Pana .....                                 | Wheeler .....          | 4,562        |
| Park City .....                            | Summit Co. R. R. ....  | 6,851        |
| Parowan .....                              | Powell .....           | 5,970        |
| Do .....                                   | Wheeler .....          | 5,910        |
| Parowan Valley .....                       | Powell .....           | { 5,900      |
|                                            |                        | { to 6,200   |
| Patmos Head .....                          | Powell .....           | 9,830        |
| Paunsagunt Plateau .....                   | Powell .....           | { 8,000      |
|                                            |                        | { to 9,300   |
| Payson .....                               | P. R. R. Reports ..... | 4,541        |
| Do .....                                   | Wheeler .....          | 4,523        |
| Do .....                                   | U. C. R. R. ....       | 4,548        |
| Do .....                                   | U. S. R. R. ....       | 4,613        |
| Pelican Peak .....                         | Powell .....           | 7,430        |
| Pennell, Mount .....                       | Powell .....           | 11,320       |
| Penellen Pass .....                        | Powell .....           | 7,730        |
| Penellen Spring .....                      | Powell .....           | 7,730        |
| Petersen .....                             | U. P. R. R. ....       | 4,907        |

| Station.                          | Authority.            | Elevation.   |
|-----------------------------------|-----------------------|--------------|
|                                   |                       | <i>Feet.</i> |
| Phillips Village .....            |                       | 4,327        |
| Pilot Peak .....                  | Wheeler .....         | 10,900       |
| Pilot Springs .....               | Wheeler .....         | 4,704        |
| Pine Valley .....                 | Powell .....          | 5,200        |
| Pine Valley Mountain .....        | Powell .....          | to 6,000     |
| Pink Cliff .....                  | Powell .....          | 10,250       |
| Pipe Springs .....                | Powell .....          | 9,260        |
| Pleasant Grove .....              | Powell .....          | 4,690        |
| Do .....                          | U. C. R. R. ....      | 4,495        |
| Pleasant, Mount. ....             | U. S. R. R. ....      | 4,557        |
| Do .....                          | Wheeler .....         | 5,875        |
| Do .....                          | Powell .....          | 5,898        |
| Pleasant Valley P. O. ....        | Wheeler .....         | 6,064        |
| Pleasant Valley .....             | Powell .....          | 7,500        |
| Plymouth .....                    | Hayden .....          | to 8,200     |
| Point Carbon .....                | King .....            | 4,500        |
| Point Nelson .....                | King .....            | 11,443       |
| Portage .....                     | Powell .....          | 10,670       |
| Potato Valley .....               | Hayden .....          | 4,700        |
| Prattville .....                  | Wheeler .....         | 5,700        |
| Promontory .....                  | Wheeler .....         | to 7,000     |
| Do .....                          | Powell .....          | 5,240        |
| Do .....                          | C. P. R. R. ....      | 4,905        |
| Do .....                          | Wheeler .....         | 7,459        |
| Provo .....                       | D. & R. G. R. R. .... | 4,517        |
| Do .....                          | U. C. R. R. ....      | 4,456        |
| Do .....                          | U. S. R. R. ....      | 4,520        |
| Do .....                          | Wheeler .....         | 4,567        |
| Do, office U. S. R. R. ....       | Powell .....          | 4,547        |
| Provo Peak (Wasatch Mountains) .. | Wheeler .....         | 11,066       |
| Do .....                          | Powell .....          | 11,000       |
| Rabbit Valley .....               | Powell .....          | 6,800        |
| Randolph .....                    | Powell .....          | to 7,500     |
| Rattlesnake Point .....           | Hayden .....          | 6,442        |
| Red Cañon Summit .....            | D. & R. G. R. R. .... | 5,701        |
| Red Plateau .....                 | D. & R. G. R. R. .... | 7,910        |
| Richey's Ranch .....              | Powell .....          | 6,000        |
| Richfield .....                   | Powell .....          | to 7,500     |
| Richmond .....                    | Powell .....          | 6,169        |
| Do .....                          | Wheeler .....         | 5,283        |
| Do .....                          | Hayden .....          | 4,537        |
| Do .....                          | U. & N. R. R. ....    | 4,536        |
| Do .....                          | Wheeler .....         | 4,658        |
| Riverside .....                   | U. C. R. R. ....      | 4,583        |
| Rockfield .....                   | U. C. R. R. ....      | 5,232        |
| Rocky Rest Spring .....           | D. & R. G. R. R. .... | 4,510        |
| Round Lake Valley .....           | Powell .....          | 5,500        |
| Round Prairie .....               | Powell .....          | to 6,000     |
| Round Valley .....                | Simpson .....         | 5,571        |
| Rush Valley .....                 | Powell .....          | 5,300        |
| Do .....                          | Powell .....          | to 6,000     |
| Do .....                          | Simpson .....         | 5,200        |
| Do .....                          | Wheeler .....         | 5,234        |
| Do .....                          | Powell .....          | 4,500        |
| Sahara Plateau .....              | Powell .....          | to 5,300     |
| Saint George .....                | Powell .....          | 4,500        |
| Saint Mary's .....                | Powell .....          | to 5,200     |
| Salem (Pondtown) .....            | Toner .....           | 2,880        |
| Salina .....                      | Toner .....           | 6,200        |
| Salina Summit .....               | Powell .....          | 4,580        |
| Salt Lake City .....              | D. & R. G. R. R. .... | 5,182        |
| Do .....                          | D. & R. G. R. R. .... | 7,927        |
| Do .....                          | D. & R. G. R. R. .... | 4,228        |
| Do .....                          | Powell .....          | 4,354        |



| Station.                                 | Authority.               | Elevation.   |
|------------------------------------------|--------------------------|--------------|
|                                          |                          | <i>Feet.</i> |
| Salt Lake City .....                     | U. C. R. R. ....         | 4,261        |
| Do.....base merid. monument.....         | U. S. Geol. Survey.....  | 4,334        |
| Do.....Signal Station.....               | U. S. Signal Office..... | 4,346        |
| Do.....observatory pier.....             | U. S. Geol. Survey.....  | 4,334        |
| Salt Lake Desert.....                    | Powell .....             | 4,200        |
|                                          |                          | } to 5,000   |
| Salt Lake Valley.....                    |                          | 4,200        |
|                                          |                          | } to 4,500   |
| Salt Spring Ranch.....                   | Wheeler .....            | 4,634        |
| Salt Wells .....                         | Wheeler .....            | 4,203        |
| Sandy .....                              | U. C. R. R. ....         | 4,399        |
| Do.....                                  | U. S. R. R. ....         | 4,457        |
| San Francisco Spring.....                | Wheeler .....            | 6,527        |
| San Pete Valley .....                    | Powell .....             | 5,200        |
|                                          |                          | } to 6,200   |
| San Rafael River .....                   | D. & R. G. R. R. ....    | 5,331        |
| San Rafael Valley .....                  | Powell .....             | 4,100        |
|                                          |                          | } to 4,200   |
| Santa Clara Settlement.....              | Powell .....             | 2,900        |
| Santaquin .....                          | Powell .....             | 5,030        |
| Do.....                                  | U. C. R. R. ....         | 4,813        |
| Do.....                                  | U. S. R. R. ....         | 4,884        |
| Santaquin Mountains (Wasatch Range)..... | Powell .....             | 9,670        |
| Saw Tooth Narrows .....                  | D. & R. G. R. R. ....    | 6,527        |
| Scipio .....                             | Powell .....             | 5,260        |
| Do.....                                  | Wheeler .....            | 5,115        |
| Scotfield .....                          | D. & R. G. R. R. ....    | 7,832        |
| Section Ridge .....                      | King .....               | 8,268        |
| Session Settlement .....                 | P. R. R. Reports.....    | 4,183        |
| Sevier Cañon .....                       | D. & R. G. R. R. ....    | 5,482        |
| Sevier Desert .....                      | Powell .....             | 5,000        |
|                                          |                          | } to 5,400   |
| Sevier Lake.....                         | Wheeler .....            | 4,600        |
| Sevier Lake Desert.....                  | Wheeler .....            | 4,874        |
| Sevier Pass (west side) .....            | Wheeler .....            | 4,768        |
| Sevier Plateau .....                     | Powell .....             | 9,000        |
|                                          |                          | } to 10,300  |
| Sevier River Bridge .....                | Powell .....             | 4,688        |
| Do.....                                  | Wheeler .....            | 5,283        |
| Sheep Salient .....                      | Powell .....             | 5,560        |
| Sheep Trough Spring.....                 | Powell .....             | 4,600        |
| Shinarump .....                          | Powell .....             | 5,330        |
| Shoonesburg .....                        | Wheeler .....            | 3,921        |
| Short Cut Pass.....                      | Simpson .....            | 5,347        |
| Silver City .....                        |                          | 6,369        |
| Skull Valley .....                       | Simpson .....            | 4,850        |
| Do.....                                  | Wheeler .....            | 4,356        |
| Skumpah .....                            | Wheeler .....            | 6,142        |
| Skutumpa or Clarkston.....               | Powell .....             | 5,930        |
| Smithfield .....                         | Hayden .....             | 4,565        |
| Do.....                                  | U. & N. R. R. ....       | 4,562        |
| Do.....                                  | Wheeler .....            | 4,623        |
| Soldier Summit .....                     | D. & R. G. R. R. ....    | 7,465        |
| Solitude Peak .....                      | Powell .....             | 8,900        |
| Sorenson Waterpocket.....                | Powell .....             | 5,630        |
| South Promontory Mountain.....           | Wheeler .....            | 7,460        |
| South Tent (Wasatch Plateau) .....       | Powell .....             | 11,240       |
| Spanish Fork .....                       | D. & R. G. R. R. ....    | 4,965        |
| Do.....                                  | U. C. R. R. ....         | 4,493        |
| Do.....                                  | U. S. R. R. ....         | 4,565        |
| Spanish Fork Peak .....                  | Powell .....             | 9,970        |
| Spanish Valley.....                      | Powell .....             | 3,900        |
|                                          |                          | } to 5,300   |
| Split Mountain.....                      | King .....               | 8,865        |

| Station.                               | Authority.            | Elevation.   |
|----------------------------------------|-----------------------|--------------|
|                                        |                       | <i>Feet.</i> |
| Springville .....                      | D. & R. G. R. R. .... | 4,566        |
| Do.....                                | U. C. R. R. ....      | 4,451        |
| Do.....                                | U. S. R. R. ....      | 4,525        |
| Stevenson, Camp.....                   | .....                 | 5,930        |
| Stevenson, Mount.....                  | Powell .....          | 10,840       |
| Strawberry Peak.....                   | Powell .....          | 9,020        |
| Strawberry Valley .....                | Powell .....          | 7,400        |
|                                        |                       | { to 8,000   |
| Sulphur Springs.....                   | D. & R. G. R. R. .... | 6,493        |
| Do..... (Escalante Desert).....        | Powell .....          | 5,101        |
| Do.....                                | Wheeler .....         | 5,400        |
| Summit (Bradbury's).....               | D. & R. G. R. R. .... | 7,190        |
| Summit Valley.....                     | Powell .....          | 6,500        |
|                                        |                       | { to 7,200   |
| Swallow Park.....                      | Powell .....          | 6,400        |
| Table Cliff.....                       | Powell .....          | 10,070       |
| Table Cliff Plateau.....               | Powell .....          | 10,000       |
|                                        |                       | { to 10,400  |
| Tantalus Point (Aquarius Plateau)..... | Powell .....          | 10,670       |
| Ten-Mile House.....                    | Wheeler .....         | 5,086        |
| Terminus.....                          | U. W. R. R. ....      | 4,991        |
| Terrace.....                           | C. P. R. R. ....      | 4,544        |
| Terrace Mountains.....                 | King.....             | 6,900        |
| Terrel's Ridge.....                    | Powell .....          | 11,380       |
| Terry's Ranch.....                     | Powell .....          | 5,660        |
| Thistle Creek.....                     | D. & R. G. R. R. .... | 5,043        |
| Thistle Creek Peak.....                | Powell .....          | 8,510        |
| Thistle Valley.....                    | Powell .....          | 5,500        |
|                                        |                       | { to 6,200   |
| Thousand Lake Mountain.....            | Powell .....          | 11,240       |
| Three Lakes.....                       | Powell .....          | 5,390        |
| Three Trees Point.....                 | Powell .....          | 6,990        |
| Timpanogos Mountain.....               | King.....             | 11,957       |
| Tingley Peak.....                      | Powell .....          | 10,260       |
| Tintic.....                            | Wheeler .....         | 4,833        |
| Tit Mesa.....                          | Powell .....          | 7,650        |
| Tockewanna Peak.....                   | King.....             | 13,458       |
| Tomasaki, Mount.....                   | Hayden.....           | 12,271       |
| Tongue Salient.....                    | Powell .....          | 9,980        |
| Tooele Peak.....                       | Wheeler .....         | 10,396       |
| Toponce Ranch.....                     | Wheeler .....         | 4,583        |
| Toquerville.....                       | Powell .....          | 3,100        |
| Trumbull, Mount.....                   | Powell .....          | 8,187        |
| Tuilla Valley.....                     | P. R. R. Reports..... | 4,487        |
| Tukuhnikavatz, Mount.....              | Hayden.....           | 10,815       |
| Tununk Plateau.....                    | Powell .....          | 6,500        |
|                                        |                       | { to 7,000   |
| Twin Peak.....                         | King.....             | 11,563       |
| Uinta.....                             | U. P. R. R. ....      | 4,519        |
| Uinta Agency.....                      | .....                 | 6,133        |
| Uinta River (mouth of).....            | Powell .....          | 4,670        |
| Uinta Valley.....                      | Powell .....          | 4,700        |
|                                        |                       | { to 6,000   |
| Un-kar-pagu.....                       | Powell .....          | 11,595       |
| Upper Kanab.....                       | Powell .....          | 6,890        |
| Utah Lake (mean stage).....            | U. S. R. R. ....      | 4,499        |
| Utah Lake Valley.....                  | Simpson.....          | 4,540        |
| Utah Valley.....                       | Powell .....          | 4,500        |
|                                        |                       | { to 5,200   |
| Ute Peak.....                          | King.....             | 8,067        |
| Van Buren's Ranch.....                 | Powell .....          | 5,990        |
| Virgin Peak.....                       | Powell .....          | 8,000        |
| Wasas, Mount.....                      | Hayden.....           | 12,561       |
| Do.....                                | Powell .....          | 12,320       |

| Station.                             | Authority.                 | Elevation.   |
|--------------------------------------|----------------------------|--------------|
|                                      |                            | <i>Feet.</i> |
| Waldsburg.....                       | Powell.....                | 5,600        |
| Walter, Mount.....                   | Powell.....                | 9,850        |
| Wanship.....                         | Summit Co. R. R.....       | 5,864        |
| Warm Spring.....                     | Wheeler.....               | 3,807        |
| Wasatch.....                         | U. P. R. R.....            | 6,833        |
| Wasatch Plateau.....                 | Powell.....                | 8,000        |
|                                      |                            | } to 11,000  |
| Washi-pah-ghum Spring.....           |                            | 4,412        |
| Washington.....                      | Powell.....                | 2,720        |
| Do.....                              | Wheeler.....               | 2,906        |
| Waterpocket Fold.....                | Powell.....                | 6,000        |
|                                      |                            | } to 7,500   |
| Weber.....                           | U. P. R. R.....            | 5,090        |
| Wellsville.....                      | Hayden.....                | 4,568        |
| Do.....                              | Wheeler.....               | 4,690        |
| Wheeler's Crag.....                  | Powell.....                | 7,850        |
| White Knob.....                      | Powell.....                | 6,800        |
| White Lake.....                      | Powell.....                | 7,950        |
| White Rock Spring, Skull Valley..... | King.....                  | 5,542        |
| White Sulphur Spring.....            |                            | 5,201        |
| White Valley.....                    | Simpson.....               | 4,360        |
| Do.....                              | Wheeler.....               | 4,436        |
| Willard City.....                    | U. & N. R. R.....          | 4,352        |
| Do.....                              | Wheeler.....               | 4,268        |
| Do.....                              | Hayden.....                | 4,350        |
| Wilson's Peak.....                   | King.....                  | 13,235       |
| Wilson Spring.....                   | D. & R. G. R. R.....       | 4,330        |
| Wonsits Valley.....                  | Powell.....                | 4,700        |
|                                      |                            | } to 5,000   |
| Bradford Station.....                | Conn. & Pass. R. R. R..... | 410          |
| Wood's Crossing.....                 | U. C. R. R.....            | 4,299        |
| Workman's Ranch.....                 | Powell.....                | 4,080        |
| Yampa Plateau.....                   | Powell.....                | 6,000        |
|                                      |                            | } to 7,000   |
| York.....                            | Powell.....                | 4,980        |
| Do.....                              | U. S. R. R.....            | 4,957        |
| Young Point.....                     | Powell.....                | 8,880        |
| Young's Ranch.....                   | Wheeler.....               | 5,642        |



# VERMONT.

| Station.                              | Authority.                  | Elevation.   |
|---------------------------------------|-----------------------------|--------------|
|                                       |                             | <i>Feet.</i> |
| <del>Alburgh</del> .....              | Cent. Vt. R. R. ....        | 127          |
| <del>Alburgh Springs</del> .....      | Cent. Vt. R. R. ....        | 119          |
| <del>Anthony, Mount</del> .....       | Geol. Survey of Vt. ....    | 2,505        |
| <del>Ascutney, Mount</del> .....      | Geol. Survey of Vt. ....    | 3,320        |
| <del>Bald Mountain</del> .....        | Geol. Survey of Vt. ....    | 3,124        |
| <del>Barnet</del> .....               | Conn. & Pass. R. R. R. .... | 466          |
| <del>Barre Junction</del> .....       | M. & W. R. R. R. ....       | 515          |
| <del>Barton</del> .....               | Conn. & Pass. R. R. R. .... | 959          |
| <del>Bartonsville</del> .....         | Cent. Vt. R. R. ....        | 469          |
| <del>Bellows Falls</del> .....        | Cheshire R. R. ....         | 305          |
| Do .....                              | Cent. Vt. R. R. ....        | 276          |
| Bethel .....                          | Cent. Vt. R. R. ....        | 576          |
| Bolton .....                          | Cent. Vt. R. R. ....        | 345          |
| Boltonville .....                     | M. & W. R. R. R. ....       | 624          |
| Bradford Station .....                | Conn. & Pass. R. R. R. .... | 410          |
| Braintree .....                       | Cent. Vt. R. R. ....        | 784          |
| Brandon .....                         | Cent. Vt. R. R. ....        | 353          |
| Brattleboro .....                     | Vt. Valley R. R. ....       | 228          |
| Brookville .....                      | Cent. Vt. R. R. ....        | 301          |
| Burke, Mount .....                    | Petermann .....             | 3,500        |
| Burlington .....                      | Cent. Vt. R. R. ....        | 109          |
| Do .... Signal Station .....          | U. S. Signal Office .....   | 268          |
| Cambridge Centre Junction .....       | Port. & Ogden R. R. ....    | 473          |
| Camel's Hump .....                    | Guyot .....                 | 4,088        |
| Cavendish .....                       | Cent. Vt. R. R. ....        | 921          |
| Charlotte .....                       | Cent. Vt. R. R. ....        | 161          |
| Chester .....                         | Cent. Vt. R. R. ....        | 501          |
| Clarendon .....                       | Cent. Vt. R. R. ....        | 639          |
| Colchester .....                      | Cent. Vt. R. R. ....        | 326          |
| Connecticut River Bridge, grade ..... | Cent. Vt. R. R. ....        | 352          |
| Cuttingsville .....                   | Cent. Vt. R. R. ....        | 1,011        |
| Danville .....                        | Port. & Ogden R. R. ....    | 1,375        |
| Derbyline .....                       | Conn. & Pass. R. R. R. .... | 1,056        |
| Dummerston .....                      | Vt. Valley R. R. ....       | 263          |
| East Berkshire .....                  | Missisquoi R. R. ....       | 441          |
| East Fairfield .....                  | Port. & Ogden R. R. ....    | 421          |
| East Hardwick .....                   | Port. & Ogden R. R. ....    | 1,087        |
| East Highgate .....                   | Port. & Ogden R. R. ....    | 365          |
| East Montpelier .....                 | M. & W. R. R. R. ....       | 720          |
| East Putney .....                     | Vt. Valley R. R. ....       | 296          |
| East Saint Johnsbury .....            | P. & O. R. R. ....          | 795          |
| East Thetford Depot .....             | Conn. & Pass. R. R. R. .... | 413          |
| East Wallingford .....                | Cent. Vt. R. R. ....        | 1,195        |
| Enosburg Falls .....                  | Missisquoi R. R. ....       | 436          |
| Eolus, Mount .....                    | Geol. Survey of Vt. ....    | 3,148        |
| Equinox Mountain .....                | Guyot .....                 | 3,872        |
| Essex Junction .....                  | Cent. Vt. R. R. ....        | 350          |
| Fairfield .....                       | Port. & Ogden R. R. ....    | 369          |
| Fairlee Station .....                 | Conn. & Pass. R. R. R. .... | 438          |
| Fletcher .....                        | Port. & Ogden R. R. ....    | 431          |
| Gassetts .....                        | Cent. Vt. R. R. ....        | 715          |
| Georgia .....                         | Cent. Vt. R. R. ....        | 365          |
| Greensborough .....                   | Port. & Ogden R. R. ....    | 1,166        |
| Groton .....                          | M. & W. R. R. R. ....       | 773          |
| Groton Pond .....                     | M. & W. R. R. R. ....       | 1,094        |
| Hardwick .....                        | Port. & Ogden R. R. ....    | 881          |
| Hartford .....                        | Woodstock R. R. ....        | 485          |
| Hartland .....                        | Cent. Vt. R. R. ....        | 423          |

| Station.                        | Authority.                  | Elev |
|---------------------------------|-----------------------------|------|
| Healdville .....                | Cent. Vt. R. R .....        |      |
| Herrick .....                   | Geol. Survey of Vt .....    |      |
| Do .....                        | Guyot .....                 |      |
| Highgate Centre .....           | Port. & Ogden R. R .....    |      |
| Hinsdale .....                  | Ashuelot R. R .....         |      |
| Hogback .....                   | Guyot .....                 |      |
| Holly, Mount .....              | Cent. Vt. R. R .....        |      |
| Hyde Park .....                 | Port. & Ogden R. R .....    |      |
| Island Pond .....               | Grand Trunk R. R .....      |      |
| Ives Pond (West Danville) ..... | Port. & Ogden R. R .....    |      |
| Jay Peak .....                  | Geol. Survey of Vt .....    |      |
| Johnson .....                   | Port. & Ogden R. R .....    |      |
| Killington Peak .....           | Guyot .....                 |      |
| Lake Champlain .....            | Port. & Ogden R. R .....    |      |
| Lanesville .....                | M. & W. R. R. R .....       |      |
| Leicester Junction .....        | Cent. Vt. R. R .....        |      |
| Lincoln, Mount .....            | Guyot .....                 |      |
| Ludlow .....                    | Cent. Vt. R. R .....        |      |
| Lydonville .....                | Conn. & Pass. R. R. R ..... |      |
| McIndoe's Depot .....           | Conn. & Pass. R. R. R ..... |      |
| McIndoe's Falls .....           | Conn. & Pass. R. R. R ..... |      |
| Mansfield, Mount .....          | Guyot .....                 |      |
| Marshfield .....                | M. & W. R. R. R .....       |      |
| Middlebury .....                | Cent. Vt. R. R .....        |      |
| Middlesex .....                 | Cent. Vt. R. R .....        |      |
| Milton .....                    | Cent. Vt. R. R .....        |      |
| Montpelier .....                | M. & W. R. R. R .....       |      |
| Montpelier Junction .....       | Cent. Vt. R. R .....        |      |
| Morrisville .....               | Port. & Ogden R. R .....    |      |
| Newbury Depot .....             | Conn. & Pass. R. R. R ..... |      |
| New Haven .....                 | Cent. Vt. R. R .....        |      |
| North Ferrisburg .....          | Cent. Vt. R. R .....        |      |
| Northfield .....                | Cent. Vt. R. R .....        |      |
| North Hartland .....            | Cent. Vt. R. R .....        |      |
| North Sheldon .....             | Missisquoi R. R .....       |      |
| North Stratford Station .....   | Geol. Survey of N. H .....  |      |
| North Thetford Depot .....      | Conn. & Pass. R. R. R ..... |      |
| Norwich Depot .....             | Conn. & Pass. R. R. R ..... |      |
| Pico Peak .....                 | Guyot .....                 |      |
| Piermont Station .....          | Conn. & Pass. R. R. R ..... |      |
| Pittsford .....                 | Cent. Vt. R. R .....        |      |
| Plainfield .....                | M. & W. R. R. R .....       |      |
| Potato Hill .....               | Geol. Survey of Vt .....    |      |
| Proctorsville .....             | Cent. Vt. R. R .....        |      |
| Prospect Mountain .....         | Geol. Survey of Vt .....    |      |
| Putney .....                    | Vt. Valley R. R .....       |      |
| Quechee .....                   | Woodstock R. R .....        |      |
| Randolph .....                  | Cent. Vt. R. R .....        |      |
| Richford .....                  | Missisquoi R. R .....       |      |
| Richmond .....                  | Cent. Vt. R. R .....        |      |
| Rockingham .....                | Cent. Vt. R. R .....        |      |
| Rouse's Point .....             | Cent. Vt. R. R .....        |      |
| Roxbury .....                   | Cent. Vt. R. R .....        |      |
| Royalton .....                  | Cent. Vt. R. R .....        |      |
| Rutland .....                   | Cent. Vt. R. R .....        |      |
| Rutland Centre .....            | Cent. Vt. R. R .....        |      |
| Ryegate, Depot platform .....   | Conn. & Pass. R. R. R ..... |      |
| Saint Albans .....              | Cent. Vt. R. R .....        |      |
| Saint Johnsbury .....           | Conn. & Pass. R. R. R ..... |      |
| Salisbury .....                 | Cent. Vt. R. R .....        |      |
| Saltaah Mountain .....          | Geol. Survey of Vt .....    |      |
| Sharon .....                    | Cent. Vt. R. R .....        |      |
| Shelburne .....                 | Cent. Vt. R. R .....        |      |
| Sheldon .....                   | Port. & Ogden R. R .....    |      |

| Station.                            | Authority.                     | Elevation.   |
|-------------------------------------|--------------------------------|--------------|
|                                     |                                | <i>Feet.</i> |
| Shrewsbury Peak .....               | Guyot.....                     | 3,845        |
| Snake Mountain .....                | Geol. Survey of Vt.....        | 1,310        |
| South Royalton .....                | Cent. Vt. R. R.....            | 508          |
| South Ryegate .....                 | M. & W. R. R. R.....           | 724          |
| South Vernon .....                  | Vt. Valley R. R.....           | 261          |
| Springfield Station, Summit at..... | Sullivan Co. (N. H.) R. R..... | 374          |
| Sterling, Mount .....               | Geol. Survey of Vt.....        | 3,700        |
| Sutherland Falls.....               | Cent. Vt. R. R.....            | 433          |
| Swanton .....                       | Port. & Ogden R. R.....        | 140          |
| Taftsville .....                    | Woodstock R. R.....            | 657          |
| Vergennes .....                     | Cent. Vt. R. R.....            | 201          |
| Walden .....                        | Port. & Ogden R. R.....        | 1,673        |
| Waterbury .....                     | Cent. Vt. R. R.....            | 434          |
| Wells River .....                   | M. & W. R. R. R.....           | 443          |
| West Concord .....                  | Port. & Ogden R. R.....        | 851          |
| West Danville .....                 | Port. & Ogden R. R.....        | 1,558        |
| West Hartford .....                 | Cent. Vt. R. R.....            | 431          |
| Westminster .....                   | Vt. Valley R. R.....           | 264          |
| White River Junction .....          | Cent. Vt. R. R.....            | 369          |
| White Rocks .....                   | Geol. Survey of Vt.....        | 2,532        |
| Williston .....                     | Cent. Vt. R. R.....            | 312          |
| Windsor .....                       | Cent. Vt. R. R.....            | 331          |
| Winocski .....                      | Cent. Vt. R. R.....            | 190          |
| Wolcott.....                        | Port. & Ogden R. R.....        | 706          |
| Woodstock Station .....             | Woodstock R. R.....            | 697          |

# VIRGINIA.

| Station.                              | Authority.                       | Elevation.   |
|---------------------------------------|----------------------------------|--------------|
|                                       |                                  | <i>Feet.</i> |
| Abingdon .....                        | N. & W. R. R. ....               | 2,069        |
| Afton .....                           | C. & O. R. R. ....               | 1,407        |
| Alexandria, O. & A. R. R. depot ..... | City Engineer .....              | 33           |
| Do .... W. & O. R. R. depot .....     | City Engineer .....              | 17           |
| Do .... W. A. & G. R. R. depot .....  | City Engineer .....              | 35           |
| Do .... A. & F. R. R. depot .....     | City Engineer .....              | 32           |
| Alleghany .....                       | N. & W. R. R. ....               | 1,280        |
| Do .....                              | C. & O. R. R. ....               | 2,056        |
| Allen Creek .....                     | R. & A. R. R. ....               | 407          |
| Amelia .....                          | R. & D. R. R. ....               | 360          |
| Amherst Court House .....             | U. S. C. & G. S. ....            | 827          |
| Anderson's .....                      | C. & O. R. R. ....               | 221          |
| Arcadia .....                         | Shenandoah Valley R. R. ....     | 796          |
| Arlington .....                       | U. S. C. & G. S. ....            | 207          |
| Ashby .....                           | Shenandoah Valley R. R. ....     | 600          |
| Ashcake .....                         | C. & O. R. R. ....               | 199          |
| Ashland .....                         | R. F. & P. R. R. ....            | 221          |
| Atlee's .....                         | C. & O. R. R. ....               | 201          |
| Backbone .....                        | C. & O. R. R. ....               | 1,692        |
| Balcony Falls .....                   | R. & A. R. R. ....               | 701          |
| Baldwin .....                         | R. & A. R. R. ....               | 970          |
| Barksdale .....                       | P. A. L. R. R. ....              | 357          |
| Bealeton .....                        | W. C., Va. M. & G. S. R. R. .... | 290          |
| Beaver Dam .....                      | C. & O. R. R. ....               | 282          |
| Bellew's .....                        | V. R. R. ....                    | 895          |
| Bellfield .....                       | Peters R. R. ....                | 107          |
| Bell's Valley .....                   | C. & O. R. R. ....               | 1,507        |
| Bentonville .....                     | Shenandoah Valley R. R. ....     | 732          |
| Berryville .....                      | Shenandoah Valley R. R. ....     | 571          |
| Bethel .....                          | R. & A. R. R. ....               | 548          |
| Big Island .....                      | R. & A. R. R. ....               | 596          |
| Big Lick .....                        | N. & W. R. R. ....               | 925          |
| Big Spring .....                      | N. & W. R. R. ....               | 1,262        |
| Big Tunnel .....                      | N. & W. R. R. ....               | 1,930        |
| Blacks and Whites .....               | N. & W. R. R. ....               | 425          |
| Blue Ridge .....                      | N. & W. R. R. ....               | 1,298        |
| Do .... depot .....                   | C. & O. R. R. ....               | 1,354        |
| Do .... (Keyes' Gap) .....            | W. & O. R. R. ....               | 960          |
| Do .... Summit .....                  | C. & O. R. R. ....               | 1,486        |
| Do .... Tunnel .....                  | C. & O. R. R. ....               | 1,432        |
| Bluff Mountain .....                  | U. S. C. & G. S. ....            | 3,522        |
| Bolling Hall .....                    | J. R. & K. Canal .....           | 167          |
| Bolling Island .....                  | J. R. & K. Canal .....           | 185          |
| Bolling's Landing .....               | J. R. & K. Canal .....           | 268          |
| Bonsacks .....                        | N. & W. R. R. ....               | 996          |
| Boscobel .....                        | R. & A. R. R. ....               | 143          |
| Boston .....                          | P. A. L. R. R. ....              | 325          |
| Boswell .....                         | R. & A. R. R. ....               | 213          |
| Boulton .....                         | R. F. & P. R. R. ....            | 199          |
| Boyceville .....                      | Shenandoah Valley R. R. ....     | 575          |
| Brand .....                           | C. & O. R. R. ....               | 1,330        |
| Brandy .....                          | W. C., Va. M. & G. S. R. R. .... | 359          |
| Bremo .....                           | J. R. & K. Canal .....           | 234          |
| Do Bluff .....                        | R. & A. R. R. ....               | 231          |
| Bristoe .....                         | W. C., Va. M. & G. S. R. R. .... | 190          |
| Broad Run .....                       | W. C., Va. M. & G. S. R. R. .... | 395          |
| Broadway .....                        | V. R. R. ....                    | 1,038        |

| Station.                     | Authority.                       | Elevation.   |
|------------------------------|----------------------------------|--------------|
|                              |                                  | <i>Feet.</i> |
| .....                        | R., F. & P. R. R. ....           | 66           |
| 's .....                     | R. & A. R. R. ....               | 291          |
| nan .....                    | Shenandoah Valley R. R. ....     | 837          |
| er .....                     | C. & O. R. R. ....               | 328          |
| on .....                     | W. C., Va. M. & G. S. R. R. .... | 508          |
| o Forge .....                | Shenandoah Valley R. R. ....     | 755          |
| o Gap .....                  | C. & O. R. R. ....               | 1,882        |
| o Mountain .....             | U. S. C. & G. S. ....            | 3,971        |
| 's .....                     | N. & W. R. R. ....               | 1,014        |
| Mountain .....               | U. S. C. & G. S. ....            | 3,216        |
| un Mountain .....            | U. S. C. & G. S. ....            | 1,375        |
| ss .....                     | C. & O. R. R. ....               | 329          |
| s .....                      | W. C., Va. M. & G. S. R. R. .... | 258          |
| ville .....                  | R. & D. R. R. ....               | 523          |
| .....                        | C. & O. R. R. ....               | 106          |
| Mountain .....               | U. S. C. & G. S. ....            | 3,571        |
| han .....                    | C. & O. R. R. ....               | 1,428        |
| well .....                   | C. & O. R. R. ....               | 356          |
| Henry, Signal Station .....  | U. S. Signal Office .....        | 16           |
| Road .....                   | V. R. R. ....                    | 701          |
| 's .....                     | W. C., Va. M. & G. S. R. R. .... | 250          |
| Point .....                  | R. & A. R. R. ....               | 159          |
| ville .....                  | Shenandoah Valley R. R. ....     | 569          |
| l Depot .....                | N. & W. R. R. ....               | 1,785        |
| ttesville .....              | C. & O. R. R. ....               | 450          |
| am .....                     | W. C., Va. M. & G. S. R. R. .... | 624          |
| Hill .....                   | B. & P. R. R. ....               | 7            |
| r .....                      | R. & P. R. R. ....               | 143          |
| hominy Bridge .....          | C. & O. R. R. ....               | 94           |
| teague, Signal Station ..... | U. S. Signal Office .....        | 18           |
| ansburg .....                | N. & W. R. R. ....               | 2,012        |
| .....                        | P. A. L. R. R. ....              | 280          |
| Road .....                   | N. & W. R. R. ....               | 303          |
| wood .....                   | N. & W. R. R. ....               | 1,766        |
| Mountain .....               | U. S. C. & G. S. ....            | 1,097        |
| Gap .....                    | W. & O. R. R. ....               | 578          |
| .....                        | N. & W. R. R. ....               | 863          |
| Forge .....                  | W. C., Va. M. & G. S. R. R. .... | 170          |
| .....                        | C. & O. R. R. ....               | 1,052        |
| dale .....                   | P. A. L. R. R. ....              | 491          |
| ld .....                     | Shenandoah Valley R. R. ....     | 1,125        |
| n .....                      | P. A. L. R. R. ....              | 323          |
| .....                        | W. C., Va. M. & G. S. R. R. .... | 401          |
| .....                        | R., Y. R. & C. R. R. ....        | 40           |
| in Falls .....               | R. & A. R. R. ....               | 578          |
| ia .....                     | R. & A. R. R. ....               | 206          |
| d .....                      | N. & W. R. R. ....               | 833          |
| tion .....                   | J. R. & K. Canal .....           | 143          |
| nd .....                     | C. & O. R. R. ....               | 1,246        |
| ton .....                    | C. & O. R. R. ....               | 1,245        |
| 's .....                     | V. R. R. ....                    | 1,107        |
| ature Bridge .....           | C. & O. R. R. ....               | 1,135        |
| ville .....                  | C. & O. R. R. ....               | 1,515        |
| .....                        | C. & O. R. R. ....               | 1,366        |
| s .....                      | Shenandoah Valley R. R. ....     | 1,242        |
| .....                        | C. & O. R. R. ....               | 718          |
| er .....                     | W. C., Va. M. & G. S. R. R. .... | 403          |
| ... Baptist Church .....     | U. S. C. & G. S. ....            | 534          |
| ... Court-House .....        | U. S. C. & G. S. ....            | 512          |
| le .....                     | W. C., Va. M. & G. S. R. R. .... | 413          |
| a .....                      | C. & O. R. R. ....               | 394          |
| ane .....                    | W. C., Va. M. & G. S. R. R. .... | 455          |
| h .....                      | R., Y. R. & C. R. R. ....        | 67           |
| anta .....                   | N. & W. R. R. ....               | 117          |

(429)



| Station.                      | Authority.                       | Elevation.   |
|-------------------------------|----------------------------------|--------------|
|                               |                                  | <i>Feet.</i> |
| Dover .....                   | R. & A. R. R. ....               | 143          |
| Drewry Bluff .....            | R. & P. R. R. ....               | 119          |
| Drummond, Lake .....          | Toner .....                      | 21           |
| Dry Fork .....                | W. C., Va. M. & G. S. R. R. .... | 624          |
| Dublin .....                  | N. & W. R. R. ....               | 2,066        |
| Do. ....                      | C. & O. R. R. ....               | 1,484        |
| Eagle Rock .....              | R. & A. R. R. ....               | 936          |
| East Liberty .....            | Shenandoah Valley R. R. ....     | 946          |
| Edinburgh .....               | V. R. R. ....                    | 845          |
| Elba .....                    | R. F. & P. R. R. ....            | 185          |
| Elizabeth Furnace .....       | C. & O. R. R. ....               | 1,812        |
| Elk Creek Mills .....         | J. R. & K. Canal .....           | 415          |
| Elk Hill .....                | R. & A. R. R. ....               | 196          |
| Elk Island .....              | R. & A. R. R. ....               | 196          |
| Elkton .....                  | Shenandoah Valley R. R. ....     | 958          |
| Ellerslie .....               | J. R. & K. Canal .....           | 143          |
| Ellerson .....                | C. & O. R. R. ....               | 106          |
| Elliot Knob .....             | U. S. C. & G. S. ....            | 4,473        |
| Emory and Henry College ..... | N. & W. R. R. ....               | 2,096        |
| Evington .....                | W. C., Va. M. & G. S. R. R. .... | 734          |
| Fairfax .....                 | W. C., Va. M. & G. S. R. R. .... | 382          |
| Fairfield .....               | Shenandoah Valley R. R. ....     | 522          |
| Fair Oaks .....               | R., Y. R. & C. R. R. ....        | 163          |
| Falls Church .....            | U. S. C. & G. S. ....            | 364          |
| Fall Creek .....              | W. C., Va. M. & G. S. R. R. .... | 535          |
| Farmville .....               | N. & W. R. R. ....               | 316          |
| Farmwell .....                | W. & O. R. R. ....               | 320          |
| Ferrol .....                  | C. & O. R. R. ....               | 1,810        |
| Fishersville .....            | C. & O. R. R. ....               | 1,320        |
| Fish Haul .....               | R., Y. R. & C. R. R. ....        | 44           |
| Ford's .....                  | N. & W. R. R. ....               | 307          |
| Forest .....                  | N. & W. R. R. ....               | 977          |
| Do. ....                      | V. R. R. ....                    | 953          |
| Fork Mountain .....           | U. S. C. & G. S. ....            | 3,851        |
| Fort Defiance .....           | V. R. R. ....                    | 1,247        |
| Fort Runyan .....             | B. & P. R. R. ....               | 27           |
| Four Mile Run .....           | B. & P. R. R. ....               | 50           |
| Franconia .....               | B. & P. R. R. ....               | 234          |
| Fredericksburgh .....         | R. F. & P. R. R. ....            | 44           |
| Fredericks Hall .....         | C. & O. R. R. ....               | 347          |
| Front Royal .....             | Shenandoah Valley R. R. ....     | 496          |
| Do. ....                      | W. C., Va. M. & G. S. R. R. .... | 546          |
| Gainesville .....             | W. C., Va. M. & G. S. R. R. .... | 357          |
| Gala Water .....              | R. & A. R. R. ....               | 936          |
| Gall's Quarry .....           | J. R. & K. Canal .....           | 208          |
| Galt's Mills .....            | J. R. & K. Canal .....           | 463          |
| Galtville .....               | R. & A. R. R. ....               | 455          |
| Garnett .....                 | C. R. O. R. R. ....              | 111          |
| Garysburgh .....              | P. & R. ....                     | 145          |
| Gish's .....                  | A., M. & O. R. R. ....           | 922          |
| Glade Spring .....            | A., M. & O. R. R. ....           | 2,088        |
| Gladstone .....               | R. & A. R. R. ....               | 399          |
| Glen Allen .....              | R. & A. R. R. ....               | 855          |
| Glenlyn .....                 | N. & W. R. R. ....               | 1,522        |
| Glenwood .....                | R. & A. R. R. ....               | 715          |
| Do. ....                      | Shenandoah Valley R. R. ....     | 760          |
| Gordonsville .....            | C. & O. R. R. ....               | 496          |
| Goshen .....                  | C. & O. R. R. ....               | 1,410        |
| Do. Bridge .....              | C. & O. R. R. ....               | 1,410        |
| Greenbay .....                | P., A. L. R. R. ....             | 589          |
| Green Springs .....           | C. & O. R. R. ....               | 589          |
| Greenville .....              | Shenandoah Valley R. R. ....     | 1,550        |
| Greenway .....                | R. & A. R. R. ....               | 383          |
| Greenwood .....               | C. & O. R. R. ....               | 1,068        |

| Station.                | Authority.                      | Elevation.   |
|-------------------------|---------------------------------|--------------|
|                         |                                 | <i>Feet.</i> |
| Greenwood Tunnel.....   | C. & O. R. R.....               | 1,072        |
| Griffiths.....          | C. & O. R. R.....               | 1,165        |
| Grove Hill.....         | Shenandoah Valley R. R.....     | 966          |
| Guilford.....           | W. & O. R. R.....               | 415          |
| Gurney's.....           | R., F. & P. R. R.....           | 121          |
| Half Way.....           | R. & P. R. R.....               | 114          |
| Hamilton.....           | W. & O. R. R.....               | 454          |
| Hanover.....            | C. & O. R. R.....               | 82           |
| Do. Junction.....       | C. & O. R. R.....               | 134          |
| Happy Creek.....        | W. C., Va. M. & G. S. R. R..... | 790          |
| Hardware.....           | R. & A. R. R.....               | 266          |
| Harrisonburgh.....      | V. R. R.....                    | 1,338        |
| Haymarket.....          | W. C., Va. M. & G. S. R. R..... | 337          |
| Herndon.....            | W. & O. R.....                  | 395          |
| Hewletts.....           | C. & O. R. R.....               | 278          |
| Holcomb Rock.....       | R. & A. R. R.....               | 562          |
| Houston.....            | Shenandoah Valley R. R.....     | 1,348        |
| Howardsville.....       | R. & A. R. R.....               | 315          |
| Humpback Mountain.....  | U. S. C. & G. S.....            | 3,645        |
| Hungary.....            | R., F. & P. R. R.....           | 214          |
| Hunslet.....            | C. & O. R. R.....               | 100          |
| Hunters.....            | W. & O. R. R.....               | 345          |
| Indian Rock.....        | R. & A. R. R.....               | 780          |
| Irish Creek.....        | Shenandoah Valley R. R.....     | 1,010        |
| Irwin.....              | R. & A. R. R.....               | 159          |
| Ivor.....               | N. & W. R. R.....               | 87           |
| Ivy.....                | C. & O. R. R.....               | 545          |
| Jackson.....            | R. & A. R. R.....               | 845          |
| Jackson's River.....    | C. & O. R. R.....               | 1,136        |
| Jarman Mountain.....    | U. S. C. & G. S.....            | 3,161        |
| Jarratts.....           | Peters. R. R.....               | 154          |
| Jenning's Ordinary..... | P. A. L. R. R.....              | 498          |
| Jetersville.....        | P. A. L. R. R.....              | 446          |
| Jordans.....            | F., O. & C. R. R.....           | 455          |
| Joshua Falls.....       | R. & A. R. R.....               | 455          |
| Kernstown.....          | V. R. R.....                    | 744          |
| Keswick.....            | W. C., Va. M. & G. S. R. R..... | 436          |
| Keysville.....          | P. A. L. R. R.....              | 625          |
| Kilby.....              | R., F. & P. R.....              | 212          |
| Kimball.....            | Shenandoah Valley R. R.....     | 895          |
| King.....               | C. & O. R. R.....               | 1,511        |
| Korah.....              | R. & A. R. R.....               | 106          |
| Lagrange.....           | C. & O. R. R.....               | 1,618        |
| Lawyer's Road.....      | W. C., Va. M. & G. S. R. R..... | 739          |
| Leesburgh Signal.....   | U. S. C. & G. S.....            | 683          |
| Leesburgh.....          | W. & O. R. R.....               | 321          |
| Lexington.....          | R. & A. R. R.....               | 958          |
| Liberty.....            | N. & W. R. R.....               | 959          |
| Linden.....             | W. C., Va. M. & G. S. R. R..... | 916          |
| Lindsay.....            | W. C., Va. M. & G. S. R. R..... | 477          |
| Linville.....           | V. R. R.....                    | 1,242        |
| Lithia.....             | Shenandoah Valley R. R.....     | 968          |
| Loch Laird.....         | R. & A. R. R.....               | 784          |
| Do.....                 | Shenandoah Valley R. R.....     | 800          |
| Lockhart's Gap.....     | W. & O. R.....                  | 896          |
| Lofton.....             | Shenandoah Valley R. R.....     | 1,785        |
| Long Branch.....        | B. & P. R. R.....               | 82           |
| Longdale.....           | C. & O. R. R.....               | 1,166        |
| Long Mountain.....      | U. S. C. & G. S.....            | 1,436        |
| Lorraine.....           | R. & A. R. R.....               | 142          |
| Louisa Court-House..... | C. & O. R. R.....               | 452          |
| Lowmoor.....            | C. & O. R. R.....               | 1,156        |
| Lowry's.....            | N. & W. R. R.....               | 791          |
| Lucado.....             | W. C., Va. M. & G. S. R. R..... | 833          |

| Station.                      | Authority.                       | Elevation.   |
|-------------------------------|----------------------------------|--------------|
|                               |                                  | <i>Feet.</i> |
| Dover .....                   | R. & A. R. R. ....               | 143          |
| Drewry Bluff .....            | R. & P. R. R. ....               | 119          |
| Drummond, Lake .....          | Toner .....                      | 21           |
| Dry Fork .....                | W. C., Va. M. & G. S. R. R. .... | 624          |
| Dublin .....                  | N. & W. R. R. ....               | 2,066        |
| Do .....                      | C. & O. R. R. ....               | 1,484        |
| Eagle Rock .....              | R. & A. R. R. ....               | 936          |
| East Liberty .....            | Shenandoah Valley R. R. ....     | 946          |
| Edinburgh .....               | V. R. R. ....                    | 845          |
| Elba .....                    | R., F. & P. R. R. ....           | 185          |
| Elizabeth Furnace .....       | C. & O. R. R. ....               | 1,812        |
| Elk Creek Mills .....         | J. R. & K. Canal .....           | 415          |
| Elk Hill .....                | R. & A. R. R. ....               | 198          |
| Elk Island .....              | R. & A. R. R. ....               | 198          |
| Elkton .....                  | Shenandoah Valley R. R. ....     | 958          |
| Ellerslie .....               | J. R. & K. Canal .....           | 143          |
| Ellerson .....                | C. & O. R. R. ....               | 106          |
| Elliot Knob .....             | U. S. C. & G. S. ....            | 4,473        |
| Emory and Henry College ..... | N. & W. R. R. ....               | 2,096        |
| Evington .....                | W. C., Va. M. & G. S. R. R. .... | 724          |
| Fairfax .....                 | W. C., Va. M. & G. S. R. R. .... | 382          |
| Fairfield .....               | Shenandoah Valley R. R. ....     | 522          |
| Fair Oaks .....               | R., Y. R. & C. R. R. ....        | 163          |
| Falls Church .....            | U. S. C. & G. S. ....            | 364          |
| Fall Creek .....              | W. C., Va. M. & G. S. R. R. .... | 535          |
| Farmville .....               | N. & W. R. R. ....               | 316          |
| Farmwell .....                | W. & O. R. R. ....               | 320          |
| Ferrol .....                  | C. & O. R. R. ....               | 1,810        |
| Fishersville .....            | C. & O. R. R. ....               | 1,320        |
| Fish Haul .....               | R., Y. R. & C. R. R. ....        | 44           |
| Ford's .....                  | N. & W. R. R. ....               | 307          |
| Forest .....                  | N. & W. R. R. ....               | 877          |
| Do .....                      | V. R. R. ....                    | 953          |
| Fork Mountain .....           | U. S. C. & G. S. ....            | 3,851        |
| Fort Defiance .....           | V. R. R. ....                    | 1,247        |
| Fort Runyan .....             | B. & P. R. R. ....               | 27           |
| Four Mile Run .....           | B. & P. R. R. ....               | 50           |
| Franconia .....               | B. & P. R. R. ....               | 234          |
| Fredericksburgh .....         | R., F. & P. R. R. ....           | 44           |
| Fredericks Hall .....         | C. & O. R. R. ....               | 347          |
| Front Royal .....             | Shenandoah Valley R. R. ....     | 496          |
| Do .....                      | W. C., Va. M. & G. S. R. R. .... | 546          |
| Gainesville .....             | W. C., Va. M. & G. S. R. R. .... | 357          |
| Gala Water .....              | R. & A. R. R. ....               | 936          |
| Gall's Quarry .....           | J. R. & K. Canal .....           | 208          |
| Galt's Mills .....            | J. R. & K. Canal .....           | 463          |
| Galtville .....               | R. & A. R. R. ....               | 455          |
| Garnett .....                 | C. & O. R. R. ....               | 111          |
| Garysburgh .....              | P. & R. ....                     | 145          |
| Gish's .....                  | A., M. & O. R. R. ....           | 922          |
| Glade Spring .....            | A., M. & O. R. R. ....           | 2,088        |
| Gladstone .....               | R. & A. R. R. ....               | 399          |
| Glen Allen .....              | R. & A. R. R. ....               | 855          |
| Glenlyn .....                 | N. & W. R. R. ....               | 1,522        |
| Glenwood .....                | R. & A. R. R. ....               | 715          |
| Do .....                      | Shenandoah Valley R. R. ....     | 760          |
| Gordonsville .....            | C. & O. R. R. ....               | 495          |
| Goshen .....                  | C. & O. R. R. ....               | 1,410        |
| Do Bridge .....               | C. & O. R. R. ....               | 1,410        |
| Greenbay .....                | P., A. L. R. R. ....             | 539          |
| Green Springs .....           | C. & O. R. R. ....               | 529          |
| Greenville .....              | Shenandoah Valley R. R. ....     | 1,550        |
| Greenway .....                | R. & A. R. R. ....               | 383          |
| Greenwood .....               | C. & O. R. R. ....               | 1,068        |

| Station.         | Authority.                      | Elevation.   |
|------------------|---------------------------------|--------------|
|                  |                                 | <i>Feet.</i> |
| od Tunnel.....   | C. & O. R. R.....               | 1,072        |
|                  | C. & O. R. R.....               | 1,166        |
| ll.....          | Shenandoah Valley R. R.....     | 966          |
|                  | W. & O. R. R.....               | 415          |
|                  | R., F. & P. R. R.....           | 121          |
| y.....           | R. & P. R. R.....               | 114          |
|                  | W. & O. R. R.....               | 454          |
|                  | C. & O. R. R.....               | 82           |
| Junction.....    | C. & O. R. R.....               | 134          |
| reek.....        | W. C., Va. M. & G. S. R. R..... | 790          |
| e.....           | R. & A. R. R.....               | 266          |
| burgh.....       | V. R. R.....                    | 1,338        |
| et.....          | W. C., Va. M. & G. S. R. R..... | 337          |
|                  | W. & O. R.....                  | 395          |
|                  | C. & O. R. R.....               | 278          |
| Rock.....        | R. & A. R. R.....               | 562          |
|                  | Shenandoah Valley R. R.....     | 1,348        |
| ville.....       | R. & A. R. R.....               | 315          |
| ok Mountain..... | U. S. C. & G. S.....            | 3,645        |
|                  | R., F. & P. R. R.....           | 214          |
|                  | C. & O. R. R.....               | 100          |
|                  | W. & O. R. R.....               | 345          |
| ock.....         | R. & A. R. R.....               | 780          |
| ek.....          | Shenandoah Valley R. R.....     | 1,010        |
|                  | R. & A. R. R.....               | 159          |
|                  | N. & W. R. R.....               | 87           |
|                  | C. & O. R. R.....               | 545          |
|                  | R. & A. R. R.....               | 845          |
| s River.....     | C. & O. R. R.....               | 1,136        |
| Mountain.....    | U. S. C. & G. S.....            | 3,161        |
|                  | Peters. R. R.....               | 154          |
| s Ordinary.....  | P. A. L. R. R.....              | 496          |
| le.....          | P. A. L. R. R.....              | 446          |
|                  | F. O. & C. R. R.....            | 455          |
| alls.....        | R. & A. R. R.....               | 455          |
| vn.....          | V. R. R.....                    | 744          |
|                  | W. C., Va. M. & G. S. R. R..... | 436          |
| s.....           | P. A. L. R. R.....              | 625          |
|                  | R., F. & P. R.....              | 212          |
|                  | Shenandoah Valley R. R.....     | 895          |
|                  | C. & O. R. R.....               | 1,511        |
|                  | R. & A. R. R.....               | 106          |
| e.....           | C. & O. R. R.....               | 1,618        |
| s Road.....      | W. C., Va. M. & G. S. R. R..... | 739          |
| gh Signal.....   | U. S. C. & G. S.....            | 683          |
| gh.....          | W. & O. R. R.....               | 321          |
| on.....          | R. & A. R. R.....               | 958          |
|                  | N. & W. R. R.....               | 959          |
|                  | W. C., Va. M. & G. S. R. R..... | 916          |
|                  | W. C., Va. M. & G. S. R. R..... | 477          |
|                  | V. R. R.....                    | 1,242        |
|                  | Shenandoah Valley R. R.....     | 968          |
| ird.....         | R. & A. R. R.....               | 784          |
|                  | Shenandoah Valley R. R.....     | 800          |
| t's Gap.....     | W. & O. R. R.....               | 896          |
|                  | Shenandoah Valley R. R.....     | 1,785        |
| snch.....        | B. & P. R. R.....               | 82           |
| s.....           | C. & O. R. R.....               | 1,166        |
| untain.....      | U. S. C. & G. S.....            | 1,436        |
|                  | R. & A. R. R.....               | 142          |
| court-House..... | C. & O. R. R.....               | 459          |
| f.....           | C. & O. R. R.....               | 1,156        |
|                  | N. & W. R. R.....               | 791          |
|                  | W. C., Va. M. & G. S. R. R..... | 833          |

| Station.                      | Authority.                        | Elevation.   |
|-------------------------------|-----------------------------------|--------------|
|                               |                                   | <i>Feet.</i> |
| Luray .....                   | Shenandoah Valley R. R. ....      | 822          |
| Lynchburgh .....              | W. C., Va. M. & G. S. R. R. ....  | 529          |
| Do..... Court House .....     | U. S. C. & G. S. ....             | 796          |
| Do..... Signal Station .....  | U. S. Signal Office .....         | 652          |
| Lynch's .....                 | W. C., Va. M. & G. S. R. R. ....  | 730          |
| Lyndhurst .....               | Shenandoah Valley R. R. ....      | 1,340        |
| Madison .....                 | W. C., Va. M. & G. S. R. R. ....  | 395          |
| Maiden Adventure .....        | R. & A. R. R. ....                | 143          |
| Manakin .....                 | R. & A. R. R. ....                | 141          |
| Manassas Junction .....       | W. C., Va. M. & G. S. R. R. ....  | 317          |
| Manchester .....              | P. A. L. R. R. ....               | 38           |
| Manchester Crossing .....     | R. & P. R. R. ....                | 102          |
| Manor .....                   | Shenandoah Valley R. R. ....      | 497          |
| Manteo .....                  | R. & A. R. R. ....                | 324          |
| Marion .....                  | N. & W. R. R. ....                | 2,136        |
| Markham .....                 | W. C., Va. M. & G. S. R. R. ....  | 552          |
| Marksville .....              | Shenandoah Valley R. R. ....      | 1,066        |
| Marlbrook .....               | Shenandoah Valley R. R. ....      | 1,165        |
| Marshall Mountain .....       | U. S. C. & G. S. ....             | 3,374        |
| Martin's .....                | N. & W. R. R. ....                | 1,919        |
| Mason's .....                 | F., O. & C. R. R. ....            | 485          |
| Mason's Tunnel .....          | C. & O. R. R. ....                | 1,592        |
| Do..... Depot .....           | C. & O. R. R. ....                | 1,551        |
| Mattoaca .....                | R. & A. R. R. ....                | 375          |
| Mattoax .....                 | P. A. L. R. R. ....               | 223          |
| Mawrertown .....              | V. R. R. ....                     | 788          |
| Max Meadows .....             | N. & W. R. R. ....                | 2,028        |
| Meadow .....                  | R., Y. R. & C. R. R. ....         | 89           |
| Mechum's River .....          | C. & O. R. R. ....                | 550          |
| Meherrin .....                | P. A. L. R. R. ....               | 589          |
| Melton .....                  | C. & O. R. R. ....                | 519          |
| Michaux's Ferry .....         | J. R. & K. Canal .....            | 143          |
| Middleton Mills .....         | R. & A. R. R. ....                | 231          |
| Do..... .....                 | J. R. & K. Canal .....            | 234          |
| Middletown .....              | V. R. R. ....                     | 660          |
| Midland .....                 | W. C., Va. M. & G., S. R. R. .... | 321          |
| Do..... Junction .....        | R. & A. R. R. ....                | 504          |
| Midway Mills .....            | R. & A. R. R. ....                | 340          |
| Millboro' .....               | C. & O. R. R. ....                | 1,679        |
| Do..... Bridge .....          | C. & O. R. R. ....                | 1,542        |
| Milford .....                 | R., F. & P. R. R. ....            | 100          |
| Miller .....                  | R. & A. R. R. ....                | 725          |
| Mitchell's .....              | W. C., Va. M. & G. S. R. R. ....  | 350          |
| Mossing Ford .....            | P. A. L. R. R. ....               | 360          |
| Mount Crawford .....          | V. R. R. ....                     | 1,171        |
| Mount Jackson .....           | V. R. R. ....                     | 916          |
| Mount Pleasant .....          | B. & P. R. R. ....                | 11           |
| Mount Sidney .....            | V. R. R. ....                     | 1,258        |
| Munson's Hill .....           | U. S. C. & G. S. ....             | 323          |
| Narrows .....                 | N. & W. R. R. ....                | 1,546        |
| Natural Bridge .....          | R. & A. R. R. ....                | 736          |
| Neabeco .....                 | B. & P. R. R. ....                | 30           |
| New Canton .....              | J. R. & K. Canal .....            | 223          |
| New Market .....              | R. & A. R. R. ....                | 350          |
| Do..... .....                 | V. R. R. ....                     | 971          |
| New River Depot .....         | N. & W. R. R. ....                | 1,757        |
| New's Ferry .....             | P. A. L. R. R. ....               | 340          |
| Newtown .....                 | V. R. R. ....                     | 731          |
| Noel's .....                  | C. & O. R. R. ....                | 254          |
| Nokesville .....              | W. C., Va. M. & G. S. R. R. ....  | 270          |
| Norfolk, Signal Station ..... | U. S. Signal Office .....         | 30           |
| North Anna .....              | C. & O. R. R. ....                | 244          |
| North Mountain .....          | C. & O. R. R. ....                | 2,064        |
| North Mountain Summit .....   | C. & O. R. R. ....                | 2,074        |

| Station.                                             | Authority.                      | Elevation.   |
|------------------------------------------------------|---------------------------------|--------------|
|                                                      |                                 | <i>Feet.</i> |
| Nottaway.....                                        | N. & W. R. R.....               | 421          |
| Orange Court-House.....                              | W. C., Va. M. & G. S. R. R..... | 506          |
| Otter River.....                                     | W. C., Va. M. & G. S. R. R..... | 665          |
| Overall.....                                         | Shenandoah Valley R. R.....     | 662          |
| Paddy, Cacapon Gap.....                              | W. & O. R. R.....               | 2,009        |
| Pamplin's.....                                       | N. & W. R. R.....               | 678          |
| Panther Gap.....                                     | C. & O. R. R.....               | 1,594        |
| Patterson.....                                       | Shenandoah Valley R. R.....     | 1,135        |
| Payne.....                                           | R. & A. R. R.....               | 266          |
| Peake.....                                           | C. & O. R. R.....               | 193          |
| Peach Grove.....                                     | U. S. C. & G. S.....            | 522          |
| Peaked Mountain.....                                 | U. S. C. & G. S.....            | 2,929        |
| Peaks of Otter.....                                  | Guyot.....                      | 3,993        |
| Do.....                                              | U. S. C. & G. S.....            | 4,001        |
| Do..... Flat Top.....                                | U. S. C. & G. S.....            | 3,875        |
| Pemberton.....                                       | R. & A. R. R.....               | 190          |
| Pendleton.....                                       | C. & O. R. R.....               | 472          |
| Penola.....                                          | R., F. & P. R. R.....           | 94           |
| Peters.....                                          | C. & O. R. R.....               | 1,175        |
| Petersburgh, Depot of N. & W. & R. & P.<br>R. R..... | City Engineer.....              | 9            |
| Do..... Depot of P. R. R.....                        | City Engineer.....              | 70           |
| Peters Mountain.....                                 | U. S. C. & G. S.....            | 1,824        |
| Plains.....                                          | W. C., Va. M. & G. S. R. R..... | 565          |
| Pleasant Hill.....                                   | Peters. R. R.....               | 119          |
| Pleasant Valley.....                                 | V. R. R.....                    | 1,248        |
| Pocahontas.....                                      | R. & P. R. R.....               | 17           |
| Do.....                                              | N. & W. R. R.....               | 2,312        |
| Pond Gap.....                                        | C. & O. R. R.....               | 1,662        |
| Port Republic.....                                   | Shenandoah Valley R. R.....     | 1,096        |
| Port Walthall.....                                   | R. & P. R. R.....               | 87           |
| Potomac Run.....                                     | R., F. & P. R. R.....           | 85           |
| Powhatan.....                                        | P. A. L. R. R.....              | 320          |
| Prospect.....                                        | N. & W. R. R.....               | 575          |
| Purcellville.....                                    | W. & O. R. R.....               | 553          |
| Quantico.....                                        | B. & P. R. R.....               | 16           |
| Ragged Mountain.....                                 | U. S. C. & G. S.....            | 3,298        |
| Rapid Anne.....                                      | W. C., Va. M. & G. S. R. R..... | 306          |
| Rappahannock.....                                    | W. C., Va. M. & G. S. R. R..... | 275          |
| Ream's.....                                          | Peters R. R.....                | 162          |
| Rectortown.....                                      | W. C., Va. M. & G. S. R. R..... | 444          |
| Rein's Island, River Lock.....                       | J. R. & K. Canal.....           | 115          |
| Reitsville.....                                      | R. & D. R. R.....               | 831          |
| Rice's.....                                          | N. & W. R. R.....               | 396          |
| Richland.....                                        | R., F. & P. R. R.....           | 10           |
| Richmond, depot of R., F. & P. R. R.....             | City Engineer.....              | 181          |
| Do..... R. & P. R. R.....                            | City Engineer.....              | 84           |
| Do..... R. & A. R. R.....                            | City Engineer.....              | 83           |
| Do..... R. & D. R. R.....                            | City Engineer.....              | 28           |
| Do..... R., Y. R. & C. R. R.....                     | City Engineer.....              | 18           |
| Do..... C. & O. R. R.....                            | City Engineer.....              | 28           |
| Rileysville.....                                     | Shenandoah Valley R. R.....     | 726          |
| Ripplemead.....                                      | N. & W. R. R.....               | 1,607        |
| River.....                                           | W. C., Va. M. & G. S. R. R..... | 493          |
| Riverside.....                                       | Shenandoah Valley R. R.....     | 938          |
| Riverton.....                                        | Shenandoah Valley R. R.....     | 497          |
| Riverville.....                                      | R. & A. R. R.....               | 423          |
| Roanoke.....                                         | Shenandoah Valley R. R.....     | 907          |
| Rock Castle.....                                     | J. R. & K. Canal.....           | 177          |
| Do.....                                              | R. & A. R. R.....               | 175          |
| Rolling Mills.....                                   | R. & A. R. R.....               | 530          |
| Remancoke.....                                       | R., Y. R. & C. R. R.....        | 44           |
| Rope Ferry.....                                      | R. & A. R. R.....               | 668          |
| Round Hill.....                                      | W. & O. R. R.....               | 556          |

| Station.                   | Authority.                      | Elevation.   |
|----------------------------|---------------------------------|--------------|
|                            |                                 | <i>Feet.</i> |
| Rural Retreat.....         | A., M. & O. R. R.....           | 2,515        |
| Rutherglen.....            | R., F. & P. R. R.....           | 203          |
| Sabbot Hill.....           | J. R. & K. Canal.....           | 143          |
| St. Asaph Junction.....    | B. & P. R. R.....               | 45           |
| Salem.....                 | W. C. Va. M. & G. S. R. R.....  | 633          |
| Salisbury.....             | R. & A. R. R.....               | 894          |
| Salt peter Cave.....       | R. & A. R. R.....               | 892          |
| Saltville.....             | N. & W. R. R.....               | 1,724        |
| Scottsburg.....            | P. A. L. R. R.....              | 342          |
| Scottsville.....           | R. & A. R. R.....               | 275          |
| Seven Mile Ford.....       | N. & W. R. R.....               | 1,968        |
| Shadwell.....              | W. C., Va. M. & G. S. R. R..... | 303          |
| Shenandoah Iron Works..... | Shenandoah Valley R. R.....     | 940          |
| Do.....R. (Snicker's)..... | W. & O. R. R.....               | 360          |
| Sherando.....              | Shenandoah Valley R. R.....     | 1,390        |
| Smith Lock.....            | R. & A. R. R.....               | 516          |
| Smith Mountain.....        | U. S. C. & G. S.....            | 2,043        |
| Snickersville.....         | W. & O. R. R.....               | 680          |
| South Anna Depot.....      | C. & O. R. R.....               | 70           |
| South Branch Mountain..... | W. & O. R. R.....               | 2,148        |
| South River.....           | R. & A. R. R.....               | 850          |
| Spear Mountain.....        | U. S. C. & G. S.....            | 1,616        |
| Spout Spring.....          | N. & W. R. R.....               | 848          |
| Springfield.....           | W. C., Va. M. & G. S. R. R..... | 940          |
| Staples Mills.....         | J. R. & K. Canal.....           | 455          |
| Stapleton.....             | R. & A. R. R.....               | 447          |
| Stanton.....               | C. & O. R. R.....               | 1,387        |
| Do.....                    | V. R. R.....                    | 1,379        |
| Staytide.....              | N. & W. R. R.....               | 1,040        |
| Steel.....                 | C. & O. R. R.....               | 1,209        |
| Stephenson's.....          | V. R. R.....                    | 499          |
| Stony Creek.....           | P. R. R.....                    | 74           |
| Strasburg.....             | W. C., Va. M. & G. S. R. R..... | 637          |
| Do.....Junction.....       | W. C., Va. M. & G. S. R. R..... | 694          |
| Stuart Draft.....          | Shenandoah Valley R. R.....     | 1,388        |
| Suffolk.....               | N. & W. R. R.....               | 58           |
| Sugarloaf Mountain.....    | U. S. C. & G. S.....            | 2,392        |
| Sweet Hall.....            | R., Y. R. & C. R. R.....        | 40           |
| Swoope.....                | C. & O. R. R.....               | 1,650        |
| Sycamore.....              | W. C., Va. M. & G. S. R. R..... | 733          |
| Do.....                    | C. & O. R. R.....               | 160          |
| Taylorville.....           | R., F. & P. R. R.....           | 119          |
| Telegraph Road.....        | B. & P. R. R.....               | 82           |
| Temples.....               | R. & P. R. R.....               | 88           |
| Thaxtons.....              | N. & W. R. R.....               | 962          |
| Thompson.....              | Shenandoah Valley R. R.....     | 790          |
| Thoroughfare.....          | W. C., Va. M. & G. S. R. R..... | 399          |
| Timberville.....           | V. R. R.....                    | 1,018        |
| Tinker Creek.....          | Shenandoah Valley R. R.....     | 961          |
| Tobacco Row Mountain.....  | U. S. C. & G. S.....            | 2,938        |
| Tolersville.....           | C. & O. R. R.....               | 463          |
| Tomahawk.....              | P. A. L. R. R.....              | 257          |
| Tonis Brook.....           | V. R. R.....                    | 745          |
| Trevilian.....             | C. & O. R. R.....               | 523          |
| Trice.....                 | C. & O. R. R.....               | 1,816        |
| Troutdale.....             | Shenandoah Valley R. R.....     | 1,400        |
| Tuckahoe.....              | J. R. & K. Canal.....           | 143          |
| Tunstalls.....             | R., Y. R. & C. R. R.....        | 60           |
| Una.....                   | C. & O. R. R.....               | 1,420        |
| Unionville.....            | F., O. & C. R. R.....           | 500          |
| Variety Springs.....       | C. & O. R. R.....               | 1,905        |
| Verdiersville.....         | F., O. & C. R. R.....           | 514          |
| Verdon.....                | C. & O. R. R.....               | 220          |
| Verona.....                | V. R. R.....                    | 1,272        |

| Station.                                   | Authority.                  | Elevation.   |
|--------------------------------------------|-----------------------------|--------------|
|                                            |                             | <i>Feet.</i> |
| Plavin's Point.....                        | N. P. R. R .....            | 950          |
| Pomeros Prairie.....                       | N. P. R. R .....            | 1,806        |
| Ranier, Mount (Tachoma).....               | U. S. C. & G. S .....       | 14,444       |
| Ritzville.....                             | N. P. R. R .....            | 1,825        |
| Ratcheen Lake.....                         | N. Trans. Survey.....       | 2,214        |
| Saint Helena, Mount .....                  | Petermann .....             | 9,750        |
| Sheets Pass.....                           | N. Trans. Survey .....      | 3,606        |
| Simquet.....                               | Pacific R. R. Reports ..... | 3,327        |
| Sister Lake.....                           | N. Trans. Survey .....      | 2,449        |
| Skalahum, Mount .....                      | Petermann .....             | 7,400        |
| Skomegan, Mount .....                      | Petermann .....             | 8,400        |
| Snake River.....                           | N. P. R. R .....            | 328          |
| Snoqualmie Pass .....                      | Pacific R. R. Reports ..... | 3,468        |
| Do.....                                    | N. Trans. Survey.....       | 3,110        |
| Spokane Falls.....                         | N. P. R. R .....            | 1,910        |
| Spokane House.....                         | Pacific R. R. Reports ..... | 1,200        |
| Sprague.....                               | N. P. R. R .....            | 1,908        |
| Stampede Pass, summit 9,100 foot tunnel .. | N. P. R. R .....            | 2,885        |
| Do..... summit of Cascade Range.           | N. P. R. R .....            | 3,960        |
| Steilacoom.....                            |                             | 1,300        |
| Do.... Fort .....                          | Med. Dept. U. S. A .....    | 300          |
| Stenger's Pass.....                        | N. Trans. Survey.....       | 3,105        |
| Stenger's Peak .....                       | N. Trans. Survey .....      | 6,299        |
| Stevens.....                               | N. P. R. R .....            | 2,282        |
| Do. Mount .....                            | Mullan .....                | 6,900        |
| Striped Peak.....                          | Mullan .....                | 6,000        |
| Stuck Junction.....                        | N. P. R. R .....            | 110          |
| Suogualuni Pass.....                       | N. Trans. Survey.....       | 3,110        |
| Tacoma Pass .....                          | N. Trans. Survey .....      | 3,430        |
| Taylor, Fort.....                          | Toner .....                 | 135          |
| Tehopahk, Mount .....                      | Petermann .....             | 7,200        |
| Tenino.....                                | N. P. R. R .....            | 315          |
| Texas Ferry.....                           | Oreg. R. R .....            | 519          |
| Townsend, Fort .....                       | Toner .....                 | 135          |
| Trent.....                                 | N. P. R. R .....            | 1,989        |
| Upper Cañon .....                          | N. P. R. R .....            | 1,750        |
| Vancouver, Fort.....                       | Med. Dept. U. S. A .....    | 50           |
| Wait's Lake.....                           | N. Trans. Survey .....      | 1,816        |
| Walla Walla.....                           | Oreg. R. R .....            | 908          |
| Do.....                                    | Wheeler.....                | 1,034        |
| Walla Walla, Fort.....                     |                             | 1,396        |
| Walla Walla Mission .....                  |                             | 2,100        |
| Wallula.....                               | Oreg. R. R .....            | 308          |
| Wallula Junction .....                     | N. P. R. R .....            | 326          |
| Willallootzas Lake .....                   | Toner .....                 | 2,940        |
| Winlock.....                               | N. P. R. R .....            | 325          |
| Yakima City.....                           | N. P. R. R .....            | 990          |
| Yakima Pass .....                          | Pacific R. R. Reports ..... | 3,468        |
| Do.....                                    | N. Trans. Survey .....      | 3,625        |
| Yelm Prairie.....                          | N. P. R. R .....            | 387          |



# WASHINGTON TERRITORY.

| Station.                         | Authority.                 | Elevation.   |
|----------------------------------|----------------------------|--------------|
|                                  |                            | <i>Feet.</i> |
| Aika, Mount.....                 | N. Trans. Survey.....      | 7,623        |
| Ainsworth.....                   | N. P. R. R.....            | 351          |
| Baker, Mount.....                | U. S. C. & G. S.....       | 10,827       |
| Do.....                          | Petermann.....             | 11,100       |
| Bellingham, Fort.....            | Med. Dept. U. S. A.....    | 88           |
| Cady's Pass.....                 | N. P. R. R. Surveys.....   | 6,147        |
| Calispell Peak.....              | N. Trans. Survey.....      | 6,905        |
| Calispellur Lake.....            | N. Trans. Survey.....      | 2,110        |
| Cantonment Stevens.....          | P. R. R. Reports.....      | 3,412        |
| Carlton, Mount.....              | N. Trans. Survey.....      | 6,060        |
| Castle Rock.....                 | N. P. R. R.....            | 83           |
| Centreville.....                 | N. P. R. R.....            | 207          |
| Chehalis.....                    | N. P. R. R.....            | 204          |
| Chewelah Peak.....               | N. Trans. Survey.....      | 5,748        |
| Colfax.....                      | Oreg. R. R.....            | 1,941        |
| Colville.....                    | N. Trans. Survey.....      | 1,917        |
| Do. Fort.....                    | P. R. R. Reports.....      | 1,215        |
| Do. do.....                      | Smithsonian Inst.....      | 1,963        |
| Do. Mount.....                   | N. Trans. Survey.....      | 5,667        |
| Constance, Mount.....            | Petermann.....             | 7,777        |
| Cowlitz Pass.....                | N. P. R. R. Surveys.....   | 4,210        |
| Dayton.....                      | Oreg. R. R.....            | 1,360        |
| Ellensburg.....                  | N. P. R. R.....            | 1,510        |
| Elorka Peak.....                 | N. Trans. Survey.....      | 1,831        |
| Eltopia.....                     | N. P. R. R.....            | 600          |
| George, Fort.....                | .....                      | 100          |
| Grange City.....                 | Oreg. R. R.....            | 502          |
| Great Plain of the Columbia..... | .....                      | { 1,000      |
| Harriston.....                   | N. P. R. R.....            | { 3,000      |
| Hood, Mount.....                 | Williamson.....            | 1,950        |
| Horseshoe Bend.....              | N. P. R. R.....            | 11,225       |
| Ike's Mountain.....              | Pacific R. R. Reports..... | 494          |
| In-chats-chan.....               | .....                      | 5,100        |
| Jefferson, Mount.....            | Humboldt.....              | 2,750        |
| Juniper.....                     | N. P. R. R.....            | 15,500       |
| Kachiss, Lake.....               | Pacific R. R. Reports..... | 318          |
| Kalama.....                      | N. P. R. R.....            | 2,158        |
| Do.....                          | Toner.....                 | 33           |
| Kechelus, Lake.....              | .....                      | 45           |
| Kuthas, Lake.....                | .....                      | 2,388        |
| Lake View.....                   | N. P. R. R.....            | 1,953        |
| Lind.....                        | N. P. R. R.....            | 324          |
| Marshall.....                    | N. P. R. R.....            | 1,363        |
| Meadow Pass.....                 | N. Trans. Survey.....      | 2,134        |
| Metre Rock.....                  | N. Trans. Survey.....      | 3,248        |
| Moscow.....                      | Oreg. R. R.....            | 2,034        |
| Natchess Pass.....               | N. Trans. Survey.....      | 2,536        |
| Do.....                          | N. Trans. Survey.....      | 4,900        |
| New Tacoma.....                  | N. P. R. R.....            | 4,900        |
| Okinokane, Fort.....             | .....                      | 31           |
| Do. Lake.....                    | Pacific R. R. Reports..... | 779          |
| Olympia, Signal Station.....     | U. S. Signal Office.....   | 1,163        |
| Olympus, Mount.....              | Wilkes.....                | 36           |
| Palouse Junction.....            | N. P. R. R.....            | 8,138        |
| Puyallup.....                    | N. P. R. R.....            | 858          |
| Picket, Camp.....                | Toner.....                 | 67           |
| Plait-il, Lake.....              | .....                      | 150          |
|                                  |                            | 1,811        |

| Station.                                                                                           | Authority.                  | Elevation.   |
|----------------------------------------------------------------------------------------------------|-----------------------------|--------------|
|                                                                                                    |                             | <i>Feet.</i> |
| Holliday Cove.....                                                                                 | P., C. & St. L. R. R.....   | 721          |
| Huntington.....                                                                                    | C. & O. R. R.....           | 566          |
| Hurricane.....                                                                                     | C. & O. R. R.....           | 6,837        |
| Ingleside.....                                                                                     | N. & W. R. R.....           | 1,937        |
| Junction Switch.....                                                                               | C. & O. R. R.....           | 560          |
| Kanawha Falls.....                                                                                 | C. & O. R. R.....           | 669          |
| Kearneysville.....                                                                                 | B. & O. R. R.....           | 589          |
| Lewiston.....                                                                                      | C. & O. R. R.....           | 616          |
| Loup Creek.....                                                                                    | C. & O. R. R.....           | 647          |
| Lowell's.....                                                                                      | C. & O. R. R.....           | 1,512        |
| Lowmoor Junction.....                                                                              | C. & O. R. R.....           | 1,155        |
| Lytleton.....                                                                                      | B. & O. R. R.....           | 930          |
| McKendree.....                                                                                     | C. & O. R. R.....           | 1,141        |
| Malden.....                                                                                        | C. & O. R. R.....           | 606          |
| Mannington.....                                                                                    | B. & O. R. R.....           | 967          |
| Martinsburgh.....                                                                                  | B. & O. R. R.....           | 435          |
| Masons Mills.....                                                                                  | C. & O. R. R.....           | 1,527        |
| Meadow Creek.....                                                                                  | C. & O. R. R.....           | 1,265        |
| Milton.....                                                                                        | C. & O. R. R.....           | 596          |
| Mohler Mills.....                                                                                  | C. & O. R. R.....           | 1,540        |
| Moorefield.....                                                                                    | W. & O. R. R.....           | 806          |
| Morgantown, Signal Station.....                                                                    | U. S. Signal Office.....    | 963          |
| Moundsville.....                                                                                   | B. & O. R. R.....           | 640          |
| Mount Carbon.....                                                                                  | C. & O. R. R.....           | 639          |
| Newburgh.....                                                                                      | B. & O. R. R.....           | 1,215        |
| New Richmond.....                                                                                  | C. & O. R. R.....           | 1,269        |
| New River Falls.....                                                                               | C. & O. R. R.....           | 1,290        |
| Do..... Bridge.....                                                                                | C. & O. R. R.....           | 827          |
| North Branch.....                                                                                  | B. & O. R. R.....           | 606          |
| North Mountain.....                                                                                | B. & O. R. R.....           | 547          |
| Nuttallburgh.....                                                                                  | C. & O. R. R.....           | 946          |
| Ona.....                                                                                           | C. & O. R. R.....           | 622          |
| Paint Creek.....                                                                                   | C. & O. R. R.....           | 622          |
| Parkersburgh, L. W. Ohio R.....                                                                    | M. & C. R. R.....           | 574          |
| Do..... H. W. Ohio R.....                                                                          | M. & C. R. R.....           | 624          |
| Do..... Bridge.....                                                                                | M. & C. R. R.....           | 664          |
| Do..... B. M. on S. front of water<br>table of P. O. & C. H.....                                   | U. S. C. & G. S.....        | 616          |
| Pawpaw.....                                                                                        | C. & O. R. R.....           | 1,237        |
| Piedmont.....                                                                                      | B. & O. R. R.....           | 925          |
| Point Mills.....                                                                                   | B. & O. R. R.....           | 896          |
| Prince.....                                                                                        | C. & O. R. R.....           | 1,192        |
| Quinnimont.....                                                                                    | C. & O. R. R.....           | 11,965       |
| Ripon.....                                                                                         | Shenandoah Valley R. R..... | 519          |
| River View.....                                                                                    | C. & O. R. R.....           | 1,072        |
| Ronceverte.....                                                                                    | C. & O. R. R.....           | 1,663        |
| Roney's Point.....                                                                                 | B. & O. R. R.....           | 829          |
| Rowlesburg, B. M. on base of center pillar<br>W. end B. & O. R. R. bridge over Cheat<br>River..... | U. S. C. & G. S.....        | 1,402        |
| Saint Albans.....                                                                                  | C. & O. R. R.....           | 592          |
| Salton.....                                                                                        | C. & O. R. R.....           | 608          |
| Scary.....                                                                                         | C. & O. R. R.....           | 591          |
| Scott.....                                                                                         | C. & O. R. R.....           | 683          |
| Sewall.....                                                                                        | C. & O. R. R.....           | 1,003        |
| Shaw.....                                                                                          | W. Va., C. & P. R. R.....   | 1,290        |
| Shenandoah Junction.....                                                                           | Shenandoah Valley R. R..... | 515          |
| Shepherdstown.....                                                                                 | Shenandoah Valley R. R..... | 405          |
| Siding.....                                                                                        | C. & O. R. R.....           | 1,150        |
| Spring Hill.....                                                                                   | C. & O. R. R.....           | 597          |
| Steeles.....                                                                                       | C. & O. R. R.....           | 1,210        |
| Stone Cliff.....                                                                                   | C. & O. R. R.....           | 1,076        |
| Summit Point.....                                                                                  | Valley R. R.....            | 623          |
| Talcott.....                                                                                       | C. & O. R. R.....           | 1,512        |

# WEST VIRGINIA.

| Station.                                                                                                | Authority.                   | Elevation.   |
|---------------------------------------------------------------------------------------------------------|------------------------------|--------------|
|                                                                                                         |                              | <i>Feet.</i> |
| Alden .....                                                                                             | C. & O. R. R. ....           | 605          |
| Alderson .....                                                                                          | C. & O. R. R. ....           | 1,548        |
| Barboursville .....                                                                                     | C. & O. R. R. ....           | 578          |
| Barksdale .....                                                                                         | C. & O. R. R. ....           | 1,338        |
| Bayard (Blackwater head).....                                                                           | W. Va., C. & P. R. R. ....   | 3,150        |
| Blacksburg .....                                                                                        | C. & O. R. R. ....           | 620          |
| Blackwater, Beaver Fork .....                                                                           | W. Va., C. & P. R. R. ....   | 3,080        |
| Blaine .....                                                                                            | W. Va., C. & P. R. R. ....   | 1,689        |
| Bluefield .....                                                                                         | N. & W. R. R. ....           | 2,552        |
| Blue Sulphur Springs .....                                                                              | C. & O. R. R. ....           | 598          |
| Broad Tree Tunnel .....                                                                                 | B. & O. R. R. ....           | 1,104        |
| Brownstown .....                                                                                        | C. & O. R. R. ....           | 608          |
| Buffalo .....                                                                                           | C. & O. R. R. ....           | 1,109        |
| Caldwell .....                                                                                          | C. & O. R. R. ....           | 1,766        |
| Cameron .....                                                                                           | B. & O. R. R. ....           | 1,049        |
| Do.....                                                                                                 | Valley R. R. ....            | 547          |
| Cannelton .....                                                                                         | C. & O. R. R. ....           | 638          |
| Caperton .....                                                                                          | C. & O. R. R. ....           | 984          |
| Carbon .....                                                                                            | B. & O. R. R. ....           | 667          |
| Ceredo .....                                                                                            | C. & O. R. R. ....           | 545          |
| Charleston .....                                                                                        | C. & O. R. R. ....           | 603          |
| Charlestown .....                                                                                       | Shenandoah Valley R. R. .... | 517          |
| Cherry Run .....                                                                                        | B. & O. R. R. ....           | 398          |
| Coalburgh .....                                                                                         | C. & O. R. R. ....           | 625          |
| Cotton Hill .....                                                                                       | C. & O. R. R. ....           | 792          |
| Cranberry Summit .....                                                                                  | B. & O. R. R. ....           | 2,551        |
| Crescent .....                                                                                          | C. & O. R. R. ....           | 638          |
| De Chantel, Mount .....                                                                                 | B. & O. R. R. ....           | 672          |
| Dimmock .....                                                                                           | C. & O. R. R. ....           | 1,045        |
| Dol Gully Tunnel .....                                                                                  | B. & O. R. R. ....           | 545          |
| Dow .....                                                                                               | C. & O. R. R. ....           | 1,432        |
| Edgington .....                                                                                         | P., C. & St. L. R. R. ....   | 704          |
| Elk-Garden Mine .....                                                                                   | W. Va., C. & P. R. R. ....   | 2,300        |
| Elm Grove .....                                                                                         | B. & O. R. R. ....           | 681          |
| Elms .....                                                                                              | C. & O. R. R. ....           | 860          |
| Fairfax Stone .....                                                                                     | W. Va., C. & P. R. R. ....   | 3,100        |
| Fairmont .....                                                                                          | B. & O. R. R. ....           | 888          |
| Falls Mills .....                                                                                       | N. & W. R. R. ....           | 2,325        |
| Fayette .....                                                                                           | C. & O. R. R. ....           | 900          |
| Fern Spring .....                                                                                       | C. & O. R. R. ....           | 914          |
| Fort Spring .....                                                                                       | C. & O. R. R. ....           | 1,626        |
| Frederick .....                                                                                         | C. & O. R. R. ....           | 640          |
| Fridelphia .....                                                                                        | B. & O. R. R. ....           | 735          |
| Gauley .....                                                                                            | C. & O. R. R. ....           | 707          |
| Glovers Gap .....                                                                                       | B. & O. R. R. ....           | 1,150        |
| Grafton, B. M. on top N. side of central<br>pier B. & O. R. R. bridge over Taggart's<br>Valley Cr ..... | U. S. C. & G. S. ....        | 997          |
| Grafton .....                                                                                           | B. & O. R. R. ....           | 985          |
| Graham .....                                                                                            | N. & W. R. R. ....           | 2,387        |
| Greenbrier Stock Yards .....                                                                            | C. & O. R. R. ....           | 1,530        |
| Guyandotte .....                                                                                        | C. & O. R. R. ....           | 560          |
| Halltown .....                                                                                          | Valley R. R. ....            | 339          |
| Hampton .....                                                                                           | C. & O. R. R. ....           | 540          |
| Harper's Ferry .....                                                                                    | B. & O. R. R. ....           | 272          |
| Do..... (bridge) .....                                                                                  | Valley R. R. ....            | 277          |
| Hawks Nest .....                                                                                        | C. & O. R. R. ....           | 827          |
| Hinton .....                                                                                            | C. & O. R. R. ....           | 137          |

| Station.                                                                                           | Authority.                  | Elevation.   |
|----------------------------------------------------------------------------------------------------|-----------------------------|--------------|
|                                                                                                    |                             | <i>Feet.</i> |
| Holliday Cove.....                                                                                 | P., C. & St. L. R. R.....   | 721          |
| Huntington.....                                                                                    | C. & O. R. R.....           | 566          |
| Hurricane.....                                                                                     | C. & O. R. R.....           | 6,837        |
| Ingleside.....                                                                                     | N. & W. R. R.....           | 1,937        |
| Junction Switch.....                                                                               | C. & O. R. R.....           | 560          |
| Kanawha Falls.....                                                                                 | C. & O. R. R.....           | 669          |
| Kearneysville.....                                                                                 | B. & O. R. R.....           | 589          |
| Lewiston.....                                                                                      | C. & O. R. R.....           | 616          |
| Loup Creek.....                                                                                    | C. & O. R. R.....           | 647          |
| Lowell's.....                                                                                      | C. & O. R. R.....           | 1,512        |
| Lowmoor Junction.....                                                                              | C. & O. R. R.....           | 1,155        |
| Lytleton.....                                                                                      | B. & O. R. R.....           | 930          |
| McKendree.....                                                                                     | C. & O. R. R.....           | 1,141        |
| Malden.....                                                                                        | C. & O. R. R.....           | 606          |
| Mannington.....                                                                                    | B. & O. R. R.....           | 967          |
| Martinsburgh.....                                                                                  | B. & O. R. R.....           | 435          |
| Masons Mills.....                                                                                  | C. & O. R. R.....           | 1,527        |
| Meadow Creek.....                                                                                  | C. & O. R. R.....           | 1,265        |
| Milton.....                                                                                        | C. & O. R. R.....           | 588          |
| Mohler Mills.....                                                                                  | C. & O. R. R.....           | 1,540        |
| Moorefield.....                                                                                    | W. & O. R. R.....           | 806          |
| Morgantown, Signal Station.....                                                                    | U. S. Signal Office.....    | 963          |
| Moundsville.....                                                                                   | B. & O. R. R.....           | 640          |
| Mount Carbon.....                                                                                  | C. & O. R. R.....           | 639          |
| Newburgh.....                                                                                      | B. & O. R. R.....           | 1,215        |
| New Richmond.....                                                                                  | C. & O. R. R.....           | 1,269        |
| New River Falls.....                                                                               | C. & O. R. R.....           | 1,290        |
| Do..... Bridge.....                                                                                | C. & O. R. R.....           | 827          |
| North Branch.....                                                                                  | B. & O. R. R.....           | 606          |
| North Mountain.....                                                                                | B. & O. R. R.....           | 547          |
| Nuttallburgh.....                                                                                  | C. & O. R. R.....           | 946          |
| Ona.....                                                                                           | C. & O. R. R.....           | 622          |
| Paint Creek.....                                                                                   | C. & O. R. R.....           | 622          |
| Parkersburgh, L. W. Ohio R.....                                                                    | M. & C. R. R.....           | 574          |
| Do..... H. W. Ohio R.....                                                                          | M. & C. R. R.....           | 624          |
| Do..... Bridge.....                                                                                | M. & C. R. R.....           | 664          |
| Do..... B. M. on S. front of water<br>table of P. O. & C. H.....                                   | U. S. C. & G. S.....        | 616          |
| Pawpaw.....                                                                                        | C. & O. R. R.....           | 1,237        |
| Piedmont.....                                                                                      | B. & O. R. R.....           | 925          |
| Point Mills.....                                                                                   | B. & O. R. R.....           | 896          |
| Prince.....                                                                                        | C. & O. R. R.....           | 1,192        |
| Quinnimont.....                                                                                    | C. & O. R. R.....           | 11,965       |
| Ripon.....                                                                                         | Shenandoah Valley R. R..... | 519          |
| River View.....                                                                                    | C. & O. R. R.....           | 1,072        |
| Ronceverte.....                                                                                    | C. & O. R. R.....           | 1,663        |
| Roney's Point.....                                                                                 | B. & O. R. R.....           | 829          |
| Rowlesburg, B. M. on base of center pillar<br>W. end B. & O. R. R. bridge over Cheat<br>River..... | U. S. C. & G. S.....        | 1,402        |
| Saint Albans.....                                                                                  | C. & O. R. R.....           | 592          |
| Salton.....                                                                                        | C. & O. R. R.....           | 608          |
| Scary.....                                                                                         | C. & O. R. R.....           | 591          |
| Scott.....                                                                                         | C. & O. R. R.....           | 683          |
| Sewall.....                                                                                        | C. & O. R. R.....           | 1,003        |
| Shaw.....                                                                                          | W. Va., C. & P. R. R.....   | 1,290        |
| Shenandoah Junction.....                                                                           | Shenandoah Valley R. R..... | 515          |
| Shepherdstown.....                                                                                 | Shenandoah Valley R. R..... | 405          |
| Siding.....                                                                                        | C. & O. R. R.....           | 1,150        |
| Spring Hill.....                                                                                   | C. & O. R. R.....           | 597          |
| Steeles.....                                                                                       | C. & O. R. R.....           | 1,210        |
| Stone Cliff.....                                                                                   | C. & O. R. R.....           | 1,076        |
| Summit Point.....                                                                                  | Valley R. R.....            | 623          |
| Talcott.....                                                                                       | C. & O. R. R.....           | 1,512        |

| Station.                                                                              | Authority.                | Elevation.   |
|---------------------------------------------------------------------------------------|---------------------------|--------------|
|                                                                                       |                           | <i>Feet.</i> |
| Eden .....                                                                            | N. W. U. R. R. ....       | 1,019        |
| Eland Junction .....                                                                  | M., L. S. & W. R. R. .... | 1,244        |
| Elkhart Lake .....                                                                    | Mil. & N. R. R. ....      | 944          |
| Elk Mound .....                                                                       | C. & N. W. R. R. ....     | 926          |
| Elroy .....                                                                           | C. & N. W. R. R. ....     | 955          |
| Erin, Geodetic Station .....                                                          | U. S. Lake Survey .....   | 1,354        |
| Evansville, B. M. on foundation stone of<br>water tank .....                          | C. & N. R. R. ....        | 893          |
| Fairchild .....                                                                       | C. & N. R. R. ....        | 1,066        |
| Fall Creek Station .....                                                              | C. & N. W. R. R. ....     | 929          |
| Fifield .....                                                                         | Wis. Cent. R. R. ....     | 1,458        |
| Fond du Lac .....                                                                     | N. W. U. R. R. ....       | 769          |
| Footville, B. M. on foundation stone of<br>water tank .....                           | C. & N. W. R. R. ....     | 816          |
| Forest Junction .....                                                                 | M., L. S. & W. R. R. .... | 830          |
| Fort Howard .....                                                                     | Mil. & N. R. R. ....      | 588          |
| Fountain City, low water .....                                                        | U. S. Engr. Corps .....   | 637          |
| Fredonia .....                                                                        | Mil. & N. R. R. ....      | 788          |
| Goodhope .....                                                                        | Mil. & N. R. R. ....      | 694          |
| Grafton .....                                                                         | Mil. & N. R. R. ....      | 752          |
| Grand Rapids .....                                                                    | G. B. & Minn. R. R. ....  | 1,024        |
| Granville .....                                                                       | N. W. U. R. R. ....       | 738          |
| Green Bay .....                                                                       | Mil. & N. R. R. ....      | 588          |
| Do... surface of Fox River .....                                                      | Mil. & N. R. R. ....      | 588          |
| Greenville .....                                                                      | M., L. S. & W. R. R. .... | 812          |
| Grimins .....                                                                         | M., L. S. & W. R. R. .... | 845          |
| Hammond .....                                                                         | C. & N. W. R. R. ....     | 1,100        |
| Hancock .....                                                                         | Wis. Cent. R. R. ....     | 1,102        |
| Hanover, cross. C. & N. W. R. R. & Monroe<br>B <sub>2</sub> of M. & St. P. R. R. .... | C. & N. W. R. R. ....     | 780          |
| Hartland .....                                                                        | Mil. & N. R. R. ....      | 839          |
| Hayton .....                                                                          | Mil. & N. R. R. ....      | 892          |
| Herr Cassel .....                                                                     | N. W. U. R. R. ....       | 1,049        |
| Hersey .....                                                                          | C. & N. W. R. R. ....     | 1,168        |
| Horicon, Geodetic Station .....                                                       | U. S. Lake Survey .....   | 1,118        |
| Horicon Lake .....                                                                    | Toner .....               | 868          |
| Hortonville .....                                                                     | M., L. S. & W. R. R. .... | 808          |
| Do... Junction .....                                                                  | M., L. S. & W. R. R. .... | 789          |
| Hudson .....                                                                          | C. & N. W. R. R. ....     | 700          |
| Humbird .....                                                                         | C. & N. W. R. R. ....     | 1,018        |
| Hunting .....                                                                         | M., L. S. & W. R. R. .... | 940          |
| Jackson .....                                                                         | N. W. U. R. R. ....       | 897          |
| Junction City .....                                                                   | Wis. Cent. R. R. ....     | 1,145        |
| Kaukauna .....                                                                        | M., L. S. & W. R. R. .... | 655          |
| Kelleys .....                                                                         | M., L. S. & W. R. R. .... | 1,248        |
| Kewaskum .....                                                                        | N. W. U. R. R. ....       | 959          |
| Kiel .....                                                                            | Mil. & N. R. R. ....      | 915          |
| Knapp .....                                                                           | C. & N. W. R. R. ....     | 919          |
| Knowlton .....                                                                        | Wis. Val. R. R. ....      | 1,131        |
| La Crosse, L. W. ....                                                                 | U. S. Engr. Corps .....   | 626          |
| Do... C. M. & St. P. R. R. depot .....                                                | City Engineer .....       | 698          |
| Do... Signal Station .....                                                            | U. S. Signal Office ..... | 708          |
| Lake Shore Junction .....                                                             | M., L. S. & W. R. R. .... | 642          |
| Lavalle .....                                                                         | C. & N. W. R. R. ....     | 897          |
| Lebanon, Geodetic Station .....                                                       | U. S. Lake Survey .....   | 1,019        |
| Lindivern .....                                                                       | N. W. U. R. R. ....       | 638          |
| Lisbon, Geodetic Station .....                                                        | U. S. Lake Survey .....   | 1,054        |
| Little Chute .....                                                                    | M., L. S. & W. R. R. .... | 707          |
| Lodi .....                                                                            | C. & N. W. R. R. ....     | 848          |
| Lowries .....                                                                         | C. & N. W. R. R. ....     | 959          |
| Madison, cross. C. & N. W. & P. du C. R. R. ....                                      | C. & N. W. R. R. ....     | 848          |
| Do... Signal Station .....                                                            | U. S. Signal Office ..... | 949          |
| Manitowoc .....                                                                       | M., L. S. & W. R. R. .... | 583          |
| Do... A. & N. L. R. R. ....                                                           | Mil. & N. R. R. ....      | 838          |

# WISCONSIN.

| Station.                                                           | Authority.               | Elevation.   |
|--------------------------------------------------------------------|--------------------------|--------------|
|                                                                    |                          | <i>Feet.</i> |
| Abbotsford.....                                                    | Wis. Cent. R. R.....     | 1,425        |
| Ableman's.....                                                     | C. & N. W. R. R.....     | 878          |
| Amherst.....                                                       | Wis. Cent. R. R.....     | 1,069        |
| Do.. Junction.....                                                 | .....                    | 1,171        |
| Do.. crossing W. C. R. R.....                                      | G. B. & Minn. R. R.....  | 1,130        |
| Angelica.....                                                      | Mil. & N. R. R.....      | 867          |
| Aniwa.....                                                         | M., L. S. & W. R. R..... | 1,418        |
| Appleton.....                                                      | M., L. S. & W. R. R..... | 715          |
| Do.. Fox River.....                                                | .....                    | 718          |
| Do.. Junction.....                                                 | M., L. S. & W. R. R..... | 801          |
| Ashland.....                                                       | Wis. Cent. R. R.....     | 678          |
| Auburndale.....                                                    | Wis. Cent. R. R.....     | 1,217        |
| Augusta.....                                                       | C. & N. W. R. R.....     | 965          |
| Baldwin.....                                                       | C. & N. W. R. R.....     | 1,132        |
| Baraboo.....                                                       | C. & N. W. R. R.....     | 861          |
| Barton.....                                                        | N. W. U. R. R.....       | 910          |
| Bear Creek.....                                                    | M., L. S. & W. R. R..... | 817          |
| Beaver.....                                                        | Wis. Val. R. R.....      | 963          |
| Belgium.....                                                       | M., L. S. & W. R. R..... | 765          |
| Beloit, crossing C. & N. W. & W. N. R. R.....                      | C. & N. W. R. R.....     | 740          |
| Do, B. M. on foundation stone of water tank.....                   | C. & N. W. R. R.....     | 741          |
| Do, level of water in Rock River.....                              | C. & N. W. R. R.....     | 729          |
| Biramwood.....                                                     | M., L. S. & W. R. R..... | 1,293        |
| Black River Station.....                                           | C. & N. W. R. R.....     | 802          |
| Blooms.....                                                        | C. & N. W. R. R.....     | 881          |
| Boyer's Bluff, Geodetic Station.....                               | U. S. Lake Survey.....   | 712          |
| Branch.....                                                        | M., L. S. & W. R. R..... | 729          |
| Bruce, Geodetic Station.....                                       | U. S. Lake Survey.....   | 767          |
| Buckbee.....                                                       | M., L. S. & W. R. R..... | 831          |
| Buena Vista.....                                                   | Wis. Cent. R. R.....     | 1,074        |
| Butte De Morts Lake, surface.....                                  | Mil. & N. R. R.....      | 735          |
| Caledonia, Geodetic Station.....                                   | U. S. Lake Survey.....   | 791          |
| Camp Douglas Junction, crossing C. & N. W. & M. & St. P. R. R..... | C. & N. W. R. R.....     | 929          |
| Ca o.....                                                          | M., L. S. & W. R. R..... | 844          |
| Cedarburgh.....                                                    | Mil. & N. R.....         | 773          |
| Cedar Grove.....                                                   | M., L. S. & W. R. R..... | 697          |
| Centralia.....                                                     | Wis. Val. R. R.....      | 1,015        |
| Centreville.....                                                   | M., L. S. & W. R. R..... | 637          |
| Chilton.....                                                       | Mil. & N. R. R.....      | 851          |
| Clayton.....                                                       | M., L. S. & W. R. R..... | 1,347        |
| Clintonville.....                                                  | M., L. S. & W. R. R..... | 824          |
| Colby.....                                                         | Wis. Cent. R. R.....     | 1,315        |
| Coloma.....                                                        | Wis. Cent. R. R.....     | 1,042        |
| Dane.....                                                          | C. & N. W. R. R.....     | 1,058        |
| Davidson's Farm.....                                               | Mil. & N. R. R.....      | 747          |
| Day's Mill.....                                                    | Mil. & N. R. R.....      | 720          |
| Deckers.....                                                       | M., L. S. & W. R. R..... | 756          |
| Delafield, Geodetic Station.....                                   | U. S. Lake Survey.....   | 1,242        |
| De Pere.....                                                       | Mil. & N. R. R.....      | 591          |
| Dexterville.....                                                   | G. B. & Minn. R. R.....  | 1,001        |
| Dillman's.....                                                     | M., L. S. & W. R. R..... | 668          |
| Dorchester.....                                                    | Wis. Cent. R. R.....     | 1,466        |
| Dover, Geodetic Station.....                                       | U. S. Lake Survey.....   | 861          |
| Dresbach, low water.....                                           | U. S. Engr. Corps.....   | 623          |
| Dundas.....                                                        | M., L. S. & W. R. R..... | 832          |
| Eau Claire.....                                                    | C. & N. W. R. R.....     | 836          |

| Station.                                       | Authority.                | Elevation.   |
|------------------------------------------------|---------------------------|--------------|
|                                                |                           | <i>Feet.</i> |
| Scandinavia .....                              | G., B. & Minn. R. R. .... | 935          |
| Schwartzburgh, junct. M. & St. P. R. R. ....   | Mil. & N. R. R. ....      | 648          |
| Scranton .....                                 | G., B. & Minn. R. R. .... | 962          |
| Shawano .....                                  | Mil. & N. R. R. ....      | 819          |
| Shawano Lake .....                             | Mil. & N. R. R. ....      | 803          |
| Sheboygan .....                                | M., L. S. & W. R. R. .... | 588          |
| Sheridan .....                                 | Wis. Cent. R. R. ....     | 1,017        |
| Sherwood .....                                 | Mil. & N. R. R. ....      | 835          |
| Silver Springs .....                           | N. W. U. R. R. ....       | 649          |
| Somers, Geodetic Station .....                 | U. S. Lake Survey .....   | 764          |
| Sparta .....                                   | C. & N. W. R. R. ....     | 786          |
| Spencer .....                                  | Wis. Gent. R. R. ....     | 1,307        |
| Split Rock .....                               | M., L. S. & W. R. R. .... | 971          |
| Springvale, Geodetic Station .....             | U. S. Lake Survey .....   | 1,044        |
| Stetsonville .....                             | Wis. Cent. R. R. ....     | 1,462        |
| Steven's Point .....                           | Wis. Cent. R. R. ....     | 1,090        |
| Sugar Bush .....                               | M., L. S. & W. R. R. .... | 827          |
| Tigerton .....                                 | M., L. S. & W. R. R. .... | 1,032        |
| Tomah .....                                    | Wis. Val. R. R. ....      | 967          |
| Trempealeau, low water .....                   | U. S. Eng'r. Corps .....  | 630          |
| Tunnel .....                                   | C. & N. W. R. R. ....     | 1,071        |
| Two Rivers .....                               | M., L. S. & W. R. R. .... | 586          |
| Ulaa .....                                     | M., L. S. & W. R. R. .... | 697          |
| Unity .....                                    | Wis. Cent. R. R. ....     | 1,333        |
| Upper Saint Croix Lake .....                   | Petermann .....           | 956          |
| Valley Junction .....                          | Wis. Val. R. R. ....      | 934          |
| Waldo .....                                    | Mil. & N. R. R. ....      | 836          |
| Wampum, Geodetic Station .....                 | U. S. Lake Survey .....   | 940          |
| Warren's .....                                 | C. & N. W. R. R. ....     | 1,019        |
| Waterford, Geodetic Station .....              | U. S. Lake Survey .....   | 949          |
| Waukechem, Summit .....                        | Mil. & N. R. R. ....      | 884          |
| Waukekee .....                                 | C. & N. W. R. R. ....     | 922          |
| Waupaca .....                                  | Wis. Cent. R. R. ....     | 899          |
| Wausau .....                                   | M., L. S. & W. R. R. .... | 1,182        |
| Do .....                                       | Wis. Val. R. R. ....      | 1,227        |
| Weeden's .....                                 | M., L. S. & W. R. R. .... | 700          |
| West Bend .....                                | N. W. U. R. R. ....       | 906          |
| Westborough .....                              | Wis. Cent. R. R. ....     | 1,469        |
| West Eau Claire .....                          | C. & N. W. R. R. ....     | 877          |
| Westfield .....                                | Wis. Cent. R. R. ....     | 860          |
| West Greenville .....                          | M., L. S. & W. R. R. .... | 892          |
| Weston .....                                   | M., L. S. & W. R. R. .... | 1,231        |
| Weyauwega .....                                | Wis. Cent. R. R. ....     | 823          |
| Whitcomb .....                                 | M., L. S. & W. R. R. .... | 1,130        |
| Whitefish Bay .....                            | M., L. S. & W. R. R. .... | 654          |
| Whittenberg .....                              | M., L. S. & W. R. R. .... | 1,177        |
| Whittlesey .....                               | Wis. Cent. R. R. ....     | 1,530        |
| Wilson .....                                   | C. & N. W. R. R. ....     | 1,147        |
| Wilton .....                                   | C. & N. W. R. R. ....     | 986          |
| Winnebago, Lake .....                          | Mil. & N. R. R. ....      | 744          |
| Winona Junction, M. & St. P. R. R. cross. .... | C. & N. W. R. R. ....     | 655          |
| Wisconsin Central Junction .....               | M., L. S. & W. R. R. .... | 755          |
| Wisconsin Valley Junction .....                | C. & N. W. R. R. ....     | 925          |
| Woodland, Geodetic Station .....               | U. S. Lake Survey .....   | 1,180        |
| Worcester .....                                | Wis. Cent. R. R. ....     | 1,605        |
| Wright's .....                                 | C. & N. W. R. R. ....     | 900          |

| Station.                                                                          | Authority.               | Elevation.   |
|-----------------------------------------------------------------------------------|--------------------------|--------------|
|                                                                                   |                          | <i>Feet.</i> |
| ille.....                                                                         | Wis. Cent. R. R.....     | 1,292        |
| ield.....                                                                         | M., L. S. & W. R. R..... | 860          |
| and, crossing of G. B. & M. R. R.....                                             | Wis. Cent. R. R.....     | 1,289        |
| d.....                                                                            | C. & N. W. R. R.....     | 659          |
| .....                                                                             | Wis. Cent. R. R.....     | 1,413        |
| .....                                                                             | M., L. S. & W. R. R..... | 813          |
| .....                                                                             | Wis. Cent. R. R.....     | 756          |
| ..... Junction.....                                                               | Mil. & N. R. R.....      | 832          |
| .....                                                                             | C. & N. W. R. R.....     | 878          |
| .....                                                                             | C. & N. W. R. R.....     | 934          |
| .....                                                                             | C. & N. W. R. R.....     | 796          |
| ..... an, Lake.....                                                               | Mil. & N. R. R.....      | 582          |
| .....                                                                             | M., L. S. & W. R. R..... | 673          |
| ..... ore.....                                                                    | Wis. Cent. R. R.....     | 1,197        |
| .....                                                                             | C. & N. W. R. R.....     | 915          |
| ..... kee, depot L. S. & M. S. R. R.....                                          | City Engineer.....       | 592          |
| ..... Union Depot.....                                                            | City Engineer.....       | 584          |
| ..... Signal Station.....                                                         | U. S. Signal Office..... | 697          |
| ..... Court-House, Geodetic Station.....                                          | U. S. Lake Survey.....   | 838          |
| .....                                                                             | G. B. & Minn. R. R.....  | 832          |
| ..... ota Junction, Geodetic Station.....                                         | U. S. Lake Survey.....   | 909          |
| ..... 's Farm.....                                                                | Mil. & N. R. R.....      | 669          |
| .....                                                                             | M., L. S. & W. R. R..... | 639          |
| ..... icka.....                                                                   | Toner.....               | 862          |
| ..... bin, Lake.....                                                              | Toner.....               | 867          |
| ..... erlin, Geodetic Station.....                                                | U. S. Lake Survey.....   | 1,073        |
| ..... olstein.....                                                                | Mil. & N. R. R.....      | 933          |
| ..... ondon.....                                                                  | M., L. S. & W. R. R..... | 756          |
| .....                                                                             | M., L. S. & W. R. R..... | 657          |
| .....                                                                             | M., L. S. & W. R. R..... | 1,296        |
| ..... ort.....                                                                    | G. B. & Minn. R. R.....  | 777          |
| ..... lk.....                                                                     | C. & N. W. R. R.....     | 1,020        |
| ..... d, Geodetic Station.....                                                    | U. S. Lake Survey.....   | 1,168        |
| ..... nowoc, Lake.....                                                            | Toner.....               | 860          |
| ..... burgh.....                                                                  | G. B. & M. R. R.....     | 865          |
| .....                                                                             | Wis. Cent. R. R.....     | 1,565        |
| ..... Station, B. M. on S. W. cor. of abut-<br>of bridge over highway, S. of..... | C. & N. W. R. R.....     | 962          |
| ..... h.....                                                                      | M., L. S. & W. R. R..... | 753          |
| ..... g.....                                                                      | M., L. S. & W. R. R..... | 696          |
| ..... aukee.....                                                                  | Wis. Cent. R. R.....     | 784          |
| ..... e.....                                                                      | Wis. Cent. R. R.....     | 1,285        |
| ..... kee, Lake.....                                                              | Toner.....               | 1,691        |
| ..... s.....                                                                      | Wis. Cent. R. R.....     | 1,454        |
| ..... old.....                                                                    | Wis. Cent. R. R.....     | 1,113        |
| .....                                                                             | Wis. Cent. R. R.....     | 1,078        |
| ..... ith.....                                                                    | Mil. & N. R. R.....      | 844          |
| ..... e.....                                                                      | Wis. Cent. R. R.....     | 792          |
| ..... dwards.....                                                                 | Wis. Val. R. R.....      | 972          |
| ..... ashington.....                                                              | M., L. S. & W. R. R..... | 669          |
| ..... ille.....                                                                   | M., L. S. & W. R. R..... | 777          |
| ..... t, low water.....                                                           | U. S. Eng'r. Corps.....  | 664          |
| ..... n Lake.....                                                                 | Mil. & N. R. R.....      | 877          |
| ..... urg.....                                                                    | C. & N. W. R. R.....     | 877          |
| ..... s.....                                                                      | C. & N. W. R. R.....     | 1,036        |
| ..... old.....                                                                    | N. W. U. R. R.....       | 890          |
| ..... nd.....                                                                     | Mil. & N. R. R.....      | 643          |
| ..... on.....                                                                     | G., B. & Minn. R. R..... | 822          |
| .....                                                                             | C. & N. W. R. R.....     | 974          |
| ..... h.....                                                                      | Wis. Val. R. R.....      | 1,146        |
| ..... le.....                                                                     | M., L. S. & W. R. R..... | 822          |
| .....                                                                             | C. & N. W. R. R.....     | 901          |
| ..... Catherine.....                                                              | N. W. U. R. R.....       | 765          |
| ..... lle.....                                                                    | Mil. & N. R. R.....      | 763          |



| Station.                                       | Authority.                | Elevation.   |
|------------------------------------------------|---------------------------|--------------|
|                                                |                           | <i>Feet.</i> |
| Scandinavia .....                              | G., B. & Minn. R. R. .... | 935          |
| Schwartzburgh, junct. M. & St. P. R. R. ....   | Mil. & N. R. R. ....      | 648          |
| Scranton .....                                 | G., B. & Minn. R. R. .... | 962          |
| Shawano .....                                  | Mil. & N. R. R. ....      | 819          |
| Shawano Lake .....                             | Mil. & N. R. R. ....      | 803          |
| Sheboygan .....                                | M., L. S. & W. R. R. .... | 588          |
| Sheridan .....                                 | Wis. Cent. R. R. ....     | 1,017        |
| Sherwood .....                                 | Mil. & N. R. R. ....      | 835          |
| Silver Springs .....                           | N. W. U. R. R. ....       | 649          |
| Somers, Geodetic Station .....                 | U. S. Lake Survey .....   | 764          |
| Sparta .....                                   | C. & N. W. R. R. ....     | 786          |
| Spencer .....                                  | Wis. Gent. R. R. ....     | 1,307        |
| Split Rock .....                               | M., L. S. & W. R. R. .... | 971          |
| Springvale, Geodetic Station .....             | U. S. Lake Survey .....   | 1,044        |
| Stetsonville .....                             | Wis. Cent. R. R. ....     | 1,462        |
| Steven's Point .....                           | Wis. Cent. R. R. ....     | 1,090        |
| Sugar Bush .....                               | M., L. S. & W. R. R. .... | 827          |
| Tigerton .....                                 | M., L. S. & W. R. R. .... | 1,032        |
| Tomah .....                                    | Wis. Val. R. R. ....      | 967          |
| Trempealeau, low water .....                   | U. S. Eng'r. Corps .....  | 630          |
| Tunnel .....                                   | C. & N. W. R. R. ....     | 1,071        |
| Two Rivers .....                               | M., L. S. & W. R. R. .... | 586          |
| Ulaos .....                                    | M., L. S. & W. R. R. .... | 697          |
| Unity .....                                    | Wis. Cent. R. R. ....     | 1,333        |
| Upper Saint Croix Lake .....                   | Petermann .....           | 956          |
| Valley Junction .....                          | Wis. Val. R. R. ....      | 934          |
| Waldo .....                                    | Mil. & N. R. R. ....      | 836          |
| Wampum, Geodetic Station .....                 | U. S. Lake Survey .....   | 940          |
| Warren's .....                                 | C. & N. W. R. R. ....     | 1,019        |
| Waterford, Geodetic Station .....              | U. S. Lake Survey .....   | 949          |
| Wauhechem, Summit .....                        | Mil. & N. R. R. ....      | 884          |
| Waukeesh .....                                 | C. & N. W. R. R. ....     | 922          |
| Waupaca .....                                  | Wis. Cent. R. R. ....     | 899          |
| Wausau .....                                   | M., L. S. & W. R. R. .... | 1,182        |
| Do .....                                       | Wis. Val. R. R. ....      | 1,227        |
| Weeden's .....                                 | M., L. S. & W. R. R. .... | 700          |
| West Bend .....                                | N. W. U. R. R. ....       | 906          |
| Westborough .....                              | Wis. Cent. R. R. ....     | 1,469        |
| West Eau Claire .....                          | C. & N. W. R. R. ....     | 877          |
| Westfield .....                                | Wis. Cent. R. R. ....     | 860          |
| West Greenville .....                          | M., L. S. & W. R. R. .... | 892          |
| Weston .....                                   | M., L. S. & W. R. R. .... | 1,231        |
| Weyauwega .....                                | Wis. Cent. R. R. ....     | 823          |
| Whitcomb .....                                 | M., L. S. & W. R. R. .... | 1,130        |
| Whitefish Bay .....                            | M., L. S. & W. R. R. .... | 654          |
| Whittenberg .....                              | M., L. S. & W. R. R. .... | 1,177        |
| Whittlesey .....                               | Wis. Cent. R. R. ....     | 1,530        |
| Wilson .....                                   | C. & N. W. R. R. ....     | 1,147        |
| Wilton .....                                   | C. & N. W. R. R. ....     | 986          |
| Winnebago, Lake .....                          | Mil. & N. R. R. ....      | 744          |
| Winona Junction, M. & St. P. R. R. cross ..... | C. & N. W. R. R. ....     | 655          |
| Wisconsin Central Junction .....               | M., L. S. & W. R. R. .... | 755          |
| Wisconsin Valley Junction .....                | C. & N. W. R. R. ....     | 925          |
| Woodland, Geodetic Station .....               | U. S. Lake Survey .....   | 1,169        |
| Worcester .....                                | Wis. Cent. R. R. ....     | 1,605        |
| Wright's .....                                 | C. & N. W. R. R. ....     | 900          |

# WYOMING.

| Station.                                            | Authority.                | Elevation.           |
|-----------------------------------------------------|---------------------------|----------------------|
|                                                     |                           | <i>Feet.</i>         |
| Amethyst Mountain, Yellowstone National Park .....  | Hayden .....              | 9,423                |
| Arrow Peak .....                                    | King .....                | 8,683                |
| Aspen .....                                         | U. P. R. R. ....          | 7,405                |
| Atlantic City .....                                 | Hayden .....              | 7,850                |
| Atlantic Peak .....                                 | Hayden .....              | 12,794               |
| Aurora .....                                        | U. P. R. R. ....          | 6,719                |
| Baird, Mount .....                                  | Hayden .....              | 9,990                |
| Bald Mountain .....                                 | Jones .....               | 9,897                |
| Do..... Wind River Range, timber-line on .....      |                           | 10,760               |
| Baronette's Bridge, Yellowstone National Park ..... | Hayden .....              | 5,978                |
| Baronette's Peak, Yellowstone National Park .....   | Hayden .....              | 10,459               |
| Barrel Spring .....                                 | Toner .....               | 6,854                |
| Bastion Mountain .....                              | King .....                | 6,991                |
| Battle Mountain .....                               | King .....                | 8,991                |
| Baxter .....                                        | Toner .....               | 6,300                |
| Beaver Lake, Yellowstone National Park .....        | Hayden .....              | 7,415                |
| Bellevue Peak .....                                 | King .....                | 9,820                |
| Beulah Lake, Yellowstone National Park .....        | Hayden .....              | 7,530                |
| Big Horn Mountains .....                            | Raynolds .....            | { 8,000<br>to 12,000 |
| Big Pond Stage Station .....                        | Toner .....               | 6,541                |
| Bison Peak, Yellowstone National Park .....         | Hayden .....              | 9,038                |
| Bitter Creek .....                                  | U. P. R. R. ....          | 6,705                |
| Black Butte .....                                   | Hayden .....              | 8,170                |
| Do..... .....                                       | King .....                | 8,176                |
| Boleter .....                                       | Toner .....               | 4,325                |
| Bradley's Peak .....                                | Hayden .....              | 9,500                |
| Bridger .....                                       | U. P. R. R. ....          | 6,637                |
| Bridger, Fort .....                                 |                           | 6,753                |
| Do..... .....                                       | Med. Dept., U. S. A. .... | 6,656                |
| Bridger's Pass .....                                | U. P. R. R. Surveys ..... | 11,410               |
| Brown, Camp .....                                   | Jones .....               | 5,498                |
| Do..... (old) .....                                 | Jones .....               | 5,447                |
| Brown's Park .....                                  | Powell .....              | 5,409                |
| Bryan .....                                         | U. P. R. R. ....          | 6,196                |
| Buford .....                                        | U. P. R. R. ....          | 7,785                |
| Bunsen Peak, Yellowstone National Park .....        | Hayden .....              | 8,775                |
| Carbon .....                                        | U. P. R. R. ....          | 6,830                |
| Castletown .....                                    | Pre. R. R. Levels .....   | 4,999                |
| Central Peak .....                                  | King .....                | 8,774                |
| Chauvenet, Mount .....                              | Hayden .....              | 13,000               |
| Cheyenne .....                                      | U. P. R. R. ....          | 6,069                |
| Do... Signal Office .....                           | U. S. Signal Office ..... | 6,069                |
| Cheyenne Pass .....                                 | King .....                | 8,791                |
| Do..... .....                                       | U. P. R. R. Surveys ..... | 8,650                |
| Chimney Peak .....                                  | King .....                | 8,168                |
| Chimney Rock .....                                  | Jones .....               | 11,853               |
| Chittenden, Mount, Yellowstone National Park .....  | Hayden .....              | 10,190               |
| Do..... .....                                       | Jones .....               | 10,027               |
| Church Buttes .....                                 | U. P. R. R. ....          | 6,368                |
| Coffin Mountain .....                               | Hayden .....              | 11,376               |
| Colorado Junction .....                             | U. P. R. R. ....          | 6,314                |
| Cooper's Lake .....                                 | U. P. R. R. ....          | 7,078                |

| Station.                                           | Authority.                 | Elevation.   |
|----------------------------------------------------|----------------------------|--------------|
|                                                    |                            | <i>Feet.</i> |
| Crater Hills, Yellowstone National Park ..         | Hayden .....               | 7,820        |
| Creston .....                                      | U. P. R. R. ....           | 7,048        |
| Deer Creek Agency .....                            | Smithsonian Inst .....     | 5,000        |
| Deer Mountain .....                                | King .....                 | 8,377        |
| Delham Peak .....                                  | King .....                 | 11,524       |
| Devil's Gate .....                                 | Petermann .....            | 6,028        |
| Doane, Mount, Yellowstone National Park.           | Hayden .....               | 10,713       |
| Dunraven Peak, Yellowstone National Park.          | Hayden .....               | 9,988        |
| Edson .....                                        | U. P. R. R. ....           | 6,772        |
| Elephant's Back, Yellowstone National Park         | Hayden .....               | 8,884        |
| Elk Mountain .....                                 | King .....                 | 11,511       |
| Encampment Meadows .....                           | King .....                 | 8,171        |
| Essex Mountain .....                               | Hayden .....               | 8,750        |
| Evans Pass .....                                   | U. P. R. R. Surveys .....  | 8,424        |
| Evanston .....                                     | Hayden .....               | 6,535        |
| Do .....                                           | U. P. R. R. ....           | 6,768        |
| Evarts, Mount, Yellowstone National Park.          | Hayden .....               | 7,600        |
| Fetterman, Fort .....                              | Petermann .....            | 4,973        |
| Do .....                                           | Toner .....                | 5,012        |
| Flaming Gorge .....                                | Powell .....               | 5,925        |
| Flat Mountain, Yellowstone National Park.          | Hayden .....               | 9,200        |
| Fremont's Peak .....                               | Fremont .....              | 13,570       |
| Do .....                                           | Hayden .....               | 13,790       |
| Gardner's River Springs, Yellowstone National Park | Hayden .....               | { 6,100      |
| Garnet Hill, Yellowstone National Park...          | Hayden .....               | { to 6,500   |
| Genie, Mount .....                                 | Hayden .....               | 7,177        |
| Geyser Basin, Lower, Yellowstone National Park     | Hayden .....               | 12,546       |
| Geyser Basin, Upper, Yellowstone National Park     | Hayden .....               | 7,250        |
| Gibbon Geyser Basin, Yellowstone National Park     | Hayden .....               | 7,400        |
| Gibbon Lake, Yellowstone National Park..           | Hayden .....               | 7,527        |
| Gilbert's Trading Post .....                       | Smithsonian Inst .....     | 7,838        |
| Grand Encampment Mountain .....                    | King .....                 | 7,400        |
| Grand Téton .....                                  | Hayden .....               | 11,003       |
| Granger .....                                      | U. P. R. R. ....           | 13,691       |
| Granite Cañon .....                                | U. P. R. R. ....           | 6,289        |
| Green River .....                                  | U. P. R. R. ....           | 7,319        |
| Do .....                                           | U. P. R. R. ....           | 6,088        |
| Do .....                                           | Astronomical Station ..... | 6,097        |
| Grizzly Mountain, Yellowstone National Park        | Hayden .....               | 9,988        |
| Gros Ventre Peak .....                             | Hayden .....               | 11,570       |
| Halleck, Fort .....                                | Toner .....                | 7,800        |
| Hallville .....                                    | Toner .....                | 6,590        |
| Hampton .....                                      | Toner .....                | 6,500        |
| Hancock, Mount .....                               | Hayden .....               | 10,235       |
| Hayden, Mount (Grand Téton) .....                  | Hayden .....               | 13,691       |
| Do .....                                           | timber line on .....       | 11,000       |
| Haystack Mountain, Yellowstone National Park       | King .....                 | 7,689        |
| Heart Lake, Yellowstone National Park...           | Hayden .....               | 7,475        |
| Hell Roaring Mountain, Yellowstone National Park   | Hayden .....               | 8,418        |
| Herring Lake, Yellowstone National Park.           | Hayden .....               | 7,530        |
| Hill City .....                                    | Pre. R. R. Levels .....    | 3,634        |
| Hilliard .....                                     | U. P. R. R. ....           | 7,236        |
| Hoback Peak .....                                  | Hayden .....               | 10,818       |
| Holmes, Mount, Yellowstone National Park.          | Hayden .....               | 10,528       |
| Hooker, Mount .....                                | Hayden .....               | 12,900       |
| Howell .....                                       | Toner .....                | 7,090        |
| Independence Rock .....                            | Petermann .....            | 6,187        |
| Index Peak .....                                   | Hayden .....               | 11,702       |

| Station.                                                          | Authority.                | Elevation    |
|-------------------------------------------------------------------|---------------------------|--------------|
|                                                                   |                           | <i>Feet.</i> |
| Inyan Kara .....                                                  | Jenney .....              | 6,700        |
| Do .....                                                          | Petermann .....           | 6,600        |
| Iron Mountain .....                                               | King .....                | 6,906        |
| Jackson's Hole .....                                              | Raynolds .....            | 6,000        |
| Langford, Mount, Yellowstone National Park .....                  | Hayden .....              | 10,779       |
| Laramie .....                                                     | U. P. R. R. .....         | 7,158        |
| Do .....                                                          | Wheeler .....             | 7,123        |
| Do. Fort .....                                                    | Med. Dept., U. S. A. .... | 4,519        |
| Do. do .....                                                      | Petermann .....           | 4,470        |
| Do. do. Flag staff .....                                          | Pre. R. R. Levels .....   | 4,274        |
| Laramie Peak .....                                                | L. O. Report, 1872 .....  | 11,000       |
| Do .....                                                          | Petermann .....           | 10,000       |
| Laramie Plains .....                                              | ..... (mean) ..           | 7,000        |
| Laramie Range .....                                               | L. O. Report, 1872 .....  | 7,000        |
| Latham .....                                                      | Toner .....               | 6,900        |
| Lawrence .....                                                    | Toner .....               | 6,200        |
| Leidy, Mount .....                                                | Hayden .....              | 11,177       |
| Lewis, Lake, Yellowstone National Park .....                      | Hayden .....              | 7,800        |
| Lookout .....                                                     | U. P. R. R. .....         | 7,177        |
| McDougal's Gap .....                                              | Hayden .....              | 8,343        |
| McDougal's Pass .....                                             | Hayden .....              | 9,300        |
| Madison Lake, Yellowstone National Park .....                     | Hayden .....              | 8,300        |
| Mammoth Hot Springs, at Cabins, Yellowstone National Park .....   | Hayden .....              | 6,387        |
| Marston .....                                                     | Toner .....               | 6,245        |
| Mary's Lake, Yellowstone National Park .....                      | Hayden .....              | 8,336        |
| Medicine Bow .....                                                | U. P. R. R. .....         | 6,571        |
| Medicine Bow Mountains .....                                      | L. O. Report, 1872 .....  | 8,000        |
| Medicine Butte (Pill Hill) .....                                  | Hayden .....              | 12,000       |
| Medicine Peak .....                                               | King .....                | 8,769        |
| Miller .....                                                      | King .....                | 12,231       |
| Millis .....                                                      | Toner .....               | 5,908        |
| Mill Peak .....                                                   | King .....                | 6,790        |
| Miner's Delight .....                                             | King .....                | 10,506       |
| Moran, Mount .....                                                | Hayden .....              | 8,419        |
| Mountain City .....                                               | Hayden .....              | 12,800       |
| Muddy Mountains .....                                             | Pre. R. R. Levels .....   | 3,589        |
| Mud Geysers on Yellowstone River, Yellowstone National Park ..... | King .....                | 8,012        |
| Do .....                                                          | Hayden .....              | 7,725        |
| Norris, Mount, Yellowstone National Park .....                    | Ludlow .....              | 7,626        |
| North Twin Butte, Lower Basin, Yellowstone National Park .....    | Hayden .....              | 10,019       |
| Owl Creek Pass .....                                              | Hayden .....              | 7,976        |
| Pacific Springs .....                                             | Jones .....               | 7,836        |
| Pelican Hill, Yellowstone National Park .....                     | Toner .....               | 7,144        |
| Percy .....                                                       | Hayden .....              | 9,580        |
| Peshen's Store .....                                              | U. P. R. R. .....         | 6,971        |
| Phil. Kearney, Fort .....                                         | King .....                | 6,500        |
| Phlox Mountain .....                                              | Med. Dept., U. S. A. .... | 6,000        |
| Piedmont .....                                                    | Jones .....               | 9,136        |
| Pierre's Hole .....                                               | U. P. R. R. .....         | 7,052        |
| Pilot Butte .....                                                 | Raynolds .....            | 6,400        |
| Pine Bluffs .....                                                 | Hayden .....              | 7,900        |
| Do .....                                                          | King .....                | 8,878        |
| Piney, Fort .....                                                 | U. P. R. R. .....         | 5,047        |
| Point of Rocks .....                                              | Lander .....              | 7,580        |
| Promontory Top, Yellowstone National Park .....                   | Lander .....              | 6,517        |
| Quasrant Mountain, Yellowstone National Park .....                | Hayden .....              | 8,706        |
| Quaking Aspen Mountain .....                                      | Hayden .....              | 10,127       |
|                                                                   | King .....                | 8,688        |

| Station.                                                              | Authority.                  | Elevation.   |
|-----------------------------------------------------------------------|-----------------------------|--------------|
|                                                                       |                             | <i>Feet.</i> |
| Quien Hornet Mountain .....                                           | King .....                  | 9,300        |
| Raw Hide Peak .....                                                   | Petermann .....             | 6,370        |
| Rawlins .....                                                         | U. P. R. R. ....            | 6,753        |
| Red Buttes .....                                                      | U. P. R. R. ....            | 7,309        |
| Red Desert .....                                                      | U. P. R. R. ....            | 6,722        |
| Red Mountain, Yellowstone National Park .....                         | Hayden .....                | 9,777        |
| Red Rock Pass .....                                                   | Hayden .....                | 7,271        |
| Reed's Pass .....                                                     | U. P. R. R. Surveys .....   | 5,850        |
| Riddle Lake, Yellowstone National Park .....                          | Hayden .....                | 8,000        |
| River Butte .....                                                     | King .....                  | 7,872        |
| Rock Creek .....                                                      | U. P. R. R. ....            | 6,713        |
| Rock Mountain .....                                                   | King .....                  | 6,885        |
| Rock Springs .....                                                    | U. P. R. R. ....            | 6,270        |
| Russell, Fort .....                                                   | Pre. R. R. Levels .....     | 6,150        |
| Do. .... (flag-staff) .....                                           | Wheeler .....               | 6,041        |
| Sailor Mountain .....                                                 | Jones .....                 | 10,046       |
| Do. .... Timber-line on .....                                         | Jones .....                 | 9,746        |
| Saint Mary's Peak .....                                               | King .....                  | 7,722        |
| Saint Vrain's Pass .....                                              | Petermann .....             | 8,000        |
| Salt Wells .....                                                      | U. P. R. R. ....            | 6,381        |
| Sanders, Fort .....                                                   | U. P. R. R. ....            | 7,190        |
| Do. .... (flag-staff) .....                                           | Wheeler, R. R. Levels ..... | 7,168        |
| Sander's Peak .....                                                   | King .....                  | 9,077        |
| Seminole Peak .....                                                   | Hayden .....                | 9,930        |
| Separation .....                                                      | U. P. R. R. ....            | 6,677        |
| Separation Peak .....                                                 | Hayden .....                | 8,500        |
| Sheep Butte .....                                                     | King .....                  | 9,722        |
| Sheridan, Mount, Yellowstone National Park .....                      | Hayden .....                | 10,385       |
| Do. ....                                                              | Jones .....                 | 10,150       |
| Sherman .....                                                         | U. P. R. R. ....            | 8,256        |
| Shoshone Geyser Basin, Yellowstone National Park .....                | Hayden .....                | 7,837        |
| Shoshone Lake, Yellowstone National Park .....                        | Hayden .....                | 7,830        |
| Sidney, Fort (flag-staff) .....                                       | Wheeler .....               | 4,106        |
| Smoothface Mountain (north), Yellowstone National Park .....          | Hayden .....                | 10,500       |
| Do. .... (south), Yellowstone National Park .....                     | Hayden .....                | 10,417       |
| Soda Hill, Yellowstone National Park .....                            | Hayden .....                | 9,518        |
| South Pass .....                                                      | Hayden .....                | 7,526        |
| Do. ....                                                              | P. R. R. Reports .....      | 7,490        |
| Do. ....                                                              | U. P. R. R. Surveys .....   | 7,470        |
| South Pass City .....                                                 | Hayden .....                | 7,873        |
| Do. ....                                                              | Petermann .....             | 7,857        |
| South Twin Butte, Lower Geyser Basin, Yellowstone National Park ..... | Hayden .....                | 7,977        |
| Spearfish City .....                                                  | Pre. R. R. Levels .....     | 3,739        |
| Specimen Ridge (top), Yellowstone National Park .....                 | Hayden .....                | 8,806        |
| Split Mountain .....                                                  | Hayden .....                | 8,260        |
| Stambaugh, Camp .....                                                 | Hayden .....                | 8,012        |
| Do. ....                                                              | Jones .....                 | 7,767        |
| Steel, Fort (flag-staff) .....                                        | Wheeler .....               | 6,850        |
| Do. ....                                                              | U. P. R. R. ....            | 6,515        |
| Steel, Mount .....                                                    | Hayden .....                | 7,770        |
| Do. ....                                                              | King .....                  | 7,771        |
| Stevenson, Mount, Yellowstone National Park .....                     | Hayden .....                | 10,420       |
| Sulphur Springs, near Bridger's Pass .....                            | Hayden .....                | 7,008        |
| Sweetwater Bridge .....                                               | Smithsonian Inst .....      | 7,000        |
| Sybelles Pass .....                                                   | U. P. R. R. Surveys .....   | 7,020        |
| Table Mountain .....                                                  | Hayden .....                | 7,728        |
| Table Rock .....                                                      | King .....                  | 7,551        |

## ADVERTISEMENT.

(Bulletin 6.)

The publications of the United States Geological Survey are issued in accordance with the statute, approved March 3, 1879, which declares that—

"The publications of the Geological Survey shall consist of the annual report of operations, geological and economic maps illustrating the resources and classifications of the lands, and reports upon general and economic geology and paleontology. The annual report of operations of the Geological Survey shall accompany the annual report of the Secretary of the Interior. All special memoirs and reports of said Survey shall be issued in uniform quarto series if deemed necessary by the Director, but otherwise in ordinary octavo. Three thousand copies of each shall be published for scientific exchanges and for sale at the price of publication; and all literary and cartographic materials received in exchange shall be the property of the United States and form a part of the library of the organization. And the money resulting from the sale of such publications shall be covered into the Treasury of the United States."

### ANNUAL REPORTS.

From the above it will be seen that only the Annual Reports, which form parts of the reports of the Secretary of the Interior and are printed as executive documents, are available for gratuitous distribution. A number of these are furnished the Survey for its exchange list, but the bulk of them are supplied directly, through the document rooms of Congress, to members of the Senate and House. Except, therefore, in those cases in which an extra number is supplied to this office by special resolution, application must be made to members of Congress for the Annual Reports, as for all other executive documents.

Of these Annuals there have been already published:

I. First Annual Report to the Hon. Carl Schurz, by Clarence King. 1880. 8°. 79 pp. 1 map.—A preliminary report describing plan of organization and publications.

II. Report of the Director of the United States Geological Survey for 1880-'81, by J. W. Powell. 1882. 8°. 1v, 568 pp. 61 pl. 1 map.

III. Third Annual Report of the United States Geological Survey, 1881-'82, by J. W. Powell. 1883. 8°. xviii, 564 pp. 67 pl. and maps.

IV. Fourth Annual Report of the United States Geological Survey, 1882-'83, by J. W. Powell. 1884. 8°. xii, 473 pp. 85 pl. and maps.

No copies of the Fourth Annual have as yet been ordered by Congress for distribution by the Geological Survey.

### MONOGRAPHS.

The Monographs of the Survey are printed for the Survey alone, and can be distributed by it only through a fair exchange for books needed in its library, or through the sale of those copies over and above the number needed for such exchange. They are not for gratuitous distribution.

So far as already determined upon, the list of these Monographs is as follows:

I. The Precious Metals, by Clarence King. In preparation.

II. Tertiary History of the Grand Cañon District, with atlas, by Capt. C. E. Dutton. Published.

III. Geology of the Comstock Lode and Washoe District, with atlas, by George F. Becker. Published.

IV. Comstock Mining and Miners, by Elliot Lord. In press.

V. Copper-bearing Rocks of Lake Superior, by Prof. R. D. Irving. In press.

VI. Older Mesozoic Flora of Virginia, by Prof. William M. Fontaine. In press.

VII. Silver-lead Deposits of Eureka, Nevada, by Joseph S. Curtis. In press.

VIII. Paleontology of the Eureka District, Nevada, by Charles D. Walcott. In press.

Geology and Mining Industry of Leadville, with atlas, by S. F. Emmons. In preparation.

Geology of the Eureka Mining District, Nevada, with atlas, by Arnold Hague. In preparation.

Coal of the United States, by Prof. R. Pumpelly. In preparation.

Iron in the United States, by Prof. R. Pumpelly. In preparation.

Lesser Metals and General Mining Resources, by Prof. R. Pumpelly. In preparation.

Lake Bonneville, by G. K. Gilbert. In preparation.

Dinocerata. A monograph on an extinct order of Ungulates, by Prof. O. C. Marsh. In press.

Sauropoda, by Prof. O. C. Marsh. In preparation.

Stegosauria, by Prof. O. C. Marsh. In preparation.

Of these Monographs, Nos. II, III, and IV are now published, viz:

## ADVERTISEMENT.

II. Tertiary History of the Grand Cañon District, with atlas, by C. E. Dutton, Capt. U. S. A. 1882. 4°. 264 pp., 42 pl. and atlas of 26 double sheets folio. Price \$10.12.

III. Geology of the Comstock Lode and Washoe District, with atlas, by George F. Baker. 1882. 4°. 422 pp. 7 pl. and atlas of 21 sheets folio. Price \$11.

IV. Comstock Mining and Miners, by Elliot Lord, 1883. 4°. 451 pp. 3 pl. Price \$1.50.

Nos. V, VI, VII, and VIII are in press and will appear in quick succession. The others, to which numbers are not assigned are in preparation.

## BULLETINS.

The Bulletins of the Survey will contain such papers relating to the general purpose of its work as do not properly come under the heads of ANNUAL REPORTS or MONOGRAPHS.

Each of these Bulletins will contain but one paper and be complete in itself. They will, however be numbered in a continuous series, and will in time be united into volumes of convenient size. To facilitate this each Bulletin will have two paginations, one proper to itself and another which belongs to it as part of the volume.

Of this series of Bulletins, Nos. 1, 2, 3, 4, 5, and 6 are already published, viz:

1. On Hypersthene-Andesite and on Triclinic Pyroxene in Augitic Rocks, by Whitman Cross, with a Geological Sketch of Buffalo Peaks, Colorado, by S. F. Emmons. 1883. 8°. 42 pp. 2 pl. Price 10 cents.

2. Gold and Silver Conversion Tables, giving the coining value of Troy ounces of fine metal, &c., by Albert Williams, jr. 1883. 8°. 3 p. l. 8 pp. Price 5 cents.

3. On the Fossil Faunas of the Upper Devonian, along the meridian of 76° 30', from Tompkins County, New York, to Bradford County, Pennsylvania, by Henry S. Williams. 1884. 8°. 31 pp. Price 5 cents.

4. On Mesozoic Fossils, by Charles A. White. 1884. 8°. 36 pp. 9 pl. Price 5 cents.

5. A Dictionary of Altitudes in the United States, by Henry Gannett. 1884. 8°. 325 pp. Price 25 cents.

6. Elevations in Canada, by J. W. Spencer, 1884. 8°. — pp. Price 5 cents.

Nos. 7 and 8 are in press.

## STATISTICAL PAPERS.

A fourth series of publications having special reference to the mineral resources of the United States is contemplated. Of that series the first has been published, viz: Mineral Resources of the United States, by Albert Williams, jr. 1883. 8°. xvii, 813 pp. Price 50 cents.

Correspondence relating to the publications of the Survey, and all remittances—which must be by postal note or money order—should be addressed to the

DIRECTOR OF THE UNITED STATES GEOLOGICAL SURVEY,

Washington, D. C.

WASHINGTON, D. C., June 15, 1884.

DEPARTMENT OF THE INTERIOR

---

BULLETIN

OF THE

53611

UNITED STATES

GEOLOGICAL SURVEY

No. 6



WASHINGTON  
GOVERNMENT PRINTING OFFICE  
1884





**UNITED STATES GEOLOGICAL SURVEY**

**J. W. POWELL DIRECTOR**

---

# **ELEVATIONS**

**IN THE**

# **DOMINION OF CANADA**

**BY**

**J. W. SPENCER**



**WASHINGTON**  
**GOVERNMENT PRINTING OFFICE**  
**1884**



### LETTER OF TRANSMITTAL.

---

COLUMBIA, Mo., *January, 1884.*

SIR: I have the honor herewith of transmitting to you, for publication, almost all of the more important elevations in the provinces of Ontario and Quebec, in Canada, which have been ascertained by railway and canal surveys, completed at the close of the year 1882. Especially in the region between the Great Lakes is the record nearly complete.

I have the honor, sir, to be your obedient servant,

J. W. SPENCER.

Hon. J. W. POWELL,

*Director of the United States Geological Survey.*



## PREFACE.

---

The knowledge of accurate levels in the study of many geological problems is growing to be as necessary as the balance has been in chemical science. In my various studies of the "Geology of the Region about the Western End of Lake Ontario," the necessity of having accurate altitudes compelled me to collect many railway levels, and often to ascertain the altitudes of other points myself. The result was that between 1876 and 1882 I had collected, with much trouble, the altitudes of all the railroads whose profiles were in existence. Owing to the fact that many of the smaller roads had been constructed independently, and subsequently united with larger organizations, it not infrequently happened that their profiles were buried away in some obscure office, or even altogether lost.

The elevation of Lake Erie above Lake Ontario, by the levels of the Welland Canal, is 326.75 feet. The United States Lake Survey's determination of the height of Lake Erie above mean ocean level is 572.86 feet. Subtracting the one from the other, the elevation of Lake Ontario above mean ocean level would be 246.11 feet. The elevation of Lake Ontario, given by the United States Lake Survey, is 246.61 feet above mean ocean level.

The Canadian survey levels have been referred to either Lake Ontario, to Lake Erie, or to Lake Saint Peter. The latter is an expansion of the Saint Lawrence River, to which high tide reaches, and its mean level is 11 feet above the mean level of the ocean.

Since these tables were compiled in 1882, the Grand Trunk Railway Company has absorbed the Great Western Railway and most of the other Canadian lines, but their original names are everywhere retained as divisions or branches of the Grand Trunk Railway.



## TABLE OF CONTENTS.

|                                                       | Page |
|-------------------------------------------------------|------|
| Letter of Transmittal .....                           | 5    |
| Preface .....                                         | 7    |
| Profiles .....                                        | 11   |
| Great Western Railway .....                           | 11   |
| Wellington, Grey and Bruce Railway .....              | 15   |
| Welland Railway .....                                 | 17   |
| Hamilton and Northwestern Railway .....               | 17   |
| Northern Railway .....                                | 18   |
| Toronto, Grey and Bruce Railway .....                 | 20   |
| Credit Valley Railway .....                           | 21   |
| Canada Southern Railway .....                         | 22   |
| Grand Trunk Railway .....                             | 23   |
| Toronto and Nipissing Railway .....                   | 29   |
| Midland Railway .....                                 | 29   |
| Ontario and Quebec Railway .....                      | 31   |
| Saint Lawrence and Ottawa Railway .....               | 32   |
| Saint Lawrence River .....                            | 33   |
| Ottawa River and Rideau Navigation Co .....           | 33   |
| Quebec, Montreal, Ottawa and Occidental Railway ..... | 33   |
| List of Elevations in Canada .....                    | 35   |





# ELEVATIONS IN THE DOMINION OF CANADA.

BY J. W. SPENCER.

## RAILROAD PROFILES.

### GREAT WESTERN RAILWAY, MAIN LINE.

| Distance<br>from Niag-<br>ara Falls. | Localities.                                   | Elevation<br>above Lake<br>Ontario. | Elevation<br>above mean<br>tide. |
|--------------------------------------|-----------------------------------------------|-------------------------------------|----------------------------------|
|                                      |                                               | <i>Feet.</i>                        | <i>Feet.</i>                     |
|                                      | Niagara River:                                |                                     |                                  |
|                                      | East side of cañon .....                      | 300                                 | 547                              |
|                                      | West side of cañon .....                      | 308                                 | 555                              |
| 0.00                                 | Niagara Falls, Ontario .....                  | 326                                 | 573                              |
| 2.84                                 | Track .....                                   | 362                                 | 609                              |
| 2.84                                 | Summit (sand and gravel) .....                | 386                                 | 633                              |
| 324.84                               | St. David's valley, track over .....          | 292                                 | 539                              |
| 9.19                                 | Meritton .....                                | 143                                 | 390                              |
| 9.39                                 | Welland canal crossing .....                  | 142                                 | 389                              |
| 10.61                                | .....                                         | 120                                 | 367                              |
| 10.70                                | Bed of creek .....                            | 20                                  | 267                              |
| 11.10                                | St. Catharine's .....                         | 110                                 | 357                              |
| 14.26                                | Bed of Fifteen-Mile creek .....               | 00                                  | 247                              |
| 15.34                                | Sixteen-Mile creek .....                      | —4                                  | 243                              |
| 15.45                                | .....                                         | 65                                  | 312                              |
| 16.95                                | Jordan station .....                          | 64                                  | 311                              |
| 17.23                                | Twenty-Mile creek, bed .....                  | —8                                  | 239                              |
| 22.69                                | Beamsville station .....                      | 47                                  | 294                              |
| 23.60                                | Grimsby station .....                         | 40                                  | 287                              |
| 31.72                                | Winona station .....                          | 38                                  | 285                              |
| 37.22                                | Stony Creek station .....                     | 28                                  | 275                              |
| 43.33                                | Hamilton station .....                        | 8                                   | 255                              |
| 45.02                                | Toronto Branch junction .....                 | 58                                  | 305                              |
| 49.00                                | .....                                         | 234                                 | 481                              |
| 49.41                                | Summit of gravel ridge (original surface) ... | 308                                 | 555                              |
|                                      | Spencer's creek:                              |                                     |                                  |
| 49.53                                | Bed .....                                     | 160                                 | 407                              |
| 49.53                                | Track .....                                   | 260                                 | 507                              |
| 49.73                                | Dundas station .....                          | 270                                 | 517                              |
| 51.70                                | Flamboro' station (old) .....                 | 368                                 | 615                              |
| 53.75                                | Summit of drift hills .....                   | 520                                 | 767                              |
| 54.73                                | Copetown station .....                        | 502                                 | 749                              |
| 54.92                                | Bed of Elliot's pond .....                    | 475                                 | 722                              |
| 59.09                                | Lynden station .....                          | 504                                 | 751                              |
| 61.84                                | Bed of valley .....                           | 415                                 | 669                              |
|                                      | Harrisburg station:                           |                                     |                                  |
| 62.25                                | Track .....                                   | 487                                 | 734                              |
| 62.25                                | Original ground .....                         | 504                                 | 751                              |
| 64.01                                | Fairchild's creek, bridge .....               | 490                                 | 737                              |
| 64.01                                | Do. bed .....                                 | 420                                 | 667                              |
| 67.23                                | .....                                         | 595                                 | 842                              |

*Great Western, main line—Continued.*

| Distance<br>from Niagara Falls. | Localities.                             | Elevation<br>above Lake<br>Ontario. | Elevation<br>above mean<br>tide. |
|---------------------------------|-----------------------------------------|-------------------------------------|----------------------------------|
| <i>Miles.</i>                   |                                         | <i>Feet.</i>                        | <i>Feet.</i>                     |
|                                 | Grand river:                            |                                     |                                  |
| 69.50                           | East side .....                         | 577                                 | 824                              |
| 69.92                           | Bed .....                               | 495                                 | 743                              |
| 72.06                           | West side .....                         | 577                                 | 824                              |
| 74.90                           | Paris station .....                     | 596                                 | 842                              |
| 75.19                           | .....                                   | 610                                 | 857                              |
| 75.23                           | Bed of valley of Nith's creek .....     | 550                                 | 797                              |
|                                 | .....                                   | 620                                 | 867                              |
| 78.98                           | Princeton station .....                 | 685                                 | 932                              |
| 79.92                           | Horner's Creek, bed .....               | 635                                 | 882                              |
| 84.00                           | Governor's Road, siding .....           | 720                                 | 967                              |
| 86.27                           | Eastwood station .....                  | 726                                 | 973                              |
| 87.69                           | Summit .....                            | 775                                 | 1,022                            |
| 90.72                           | Woodstock station .....                 | 710                                 | 957                              |
| 95.55                           | Beechville station .....                | 660                                 | 907                              |
| 100.00                          | Ingersoll station .....                 | 632                                 | 879                              |
| 109.66                          | Dorchester station .....                | 605                                 | 852                              |
| 119.28                          | London, Richmond street .....           | 559                                 | 806                              |
|                                 | Thames River:                           |                                     |                                  |
| 119.50                          | East side .....                         | 553                                 | 800                              |
|                                 | Bed .....                               | 507                                 | 754                              |
| 119.73                          | West side .....                         | 560                                 | 807                              |
|                                 | Cove of Thames:                         |                                     |                                  |
| 120.17                          | East side .....                         | 550                                 | 797                              |
| 120.64                          | Bottom .....                            | 505                                 | 752                              |
| 122.82                          | West side .....                         | 680                                 | 927                              |
| 129.17                          | Komoka station .....                    | 564                                 | 811                              |
| 139.96                          | Longwood station .....                  | 505                                 | 752                              |
| 142.50                          | Canada Southern railroad crossing ..... | .....                               | .....                            |
| 144.89                          | Oppin station .....                     | 496                                 | 743                              |
| 149.62                          | Glencoe station .....                   | 483                                 | 730                              |
| 155.87                          | Newbury station .....                   | 455                                 | 702                              |
| 160.70                          | Bothwell station .....                  | 444                                 | 691                              |
| 169.51                          | Thamesville bridge .....                | 376                                 | 623                              |
| 169.51                          | bed of river .....                      | 340                                 | 587                              |
| 174.34                          | Lewisville station .....                | 368                                 | 615                              |
| 183.33                          | Chatham station .....                   | 351                                 | 598                              |
| 198.11                          | Baptist Creek station .....             | 348                                 | 595                              |
| 202.84                          | Stoney Point station .....              | 340                                 | 587                              |
| 211.66                          | Bell river, bed .....                   | 320                                 | 567                              |
| 220.81                          | Tecumseh station .....                  | 343                                 | 590                              |
| 228.82                          | Windsor station .....                   | 335                                 | 582                              |

## GREAT WESTERN RAILWAY—TORONTO BRANCH.

| Distance<br>from Hamilton Station. | Localities.                                       | Elevation<br>above Lake<br>Ontario. | Elevation<br>above mean<br>tide. |
|------------------------------------|---------------------------------------------------|-------------------------------------|----------------------------------|
| <i>Miles.</i>                      |                                                   | <i>Feet.</i>                        | <i>Feet.</i>                     |
| 0.00                               | Hamilton station .....                            | 8                                   | 255                              |
| 1.62                               | Toronto junction .....                            | 58                                  | 306                              |
| 2.15                               | Track over old outlet of Dundas marsh .....       | 82                                  | 329                              |
| 2.15                               | Piles driven in marsh to below lake Ontario ..... | —40                                 | 207                              |
| 4.08                               | Waterdown station, ground .....                   | 98                                  | 345                              |
| 4.67                               | Lake Terrace (Ballast Hill) .....                 | 118                                 | 365                              |
| 7.02                               | Burlington station .....                          | 93                                  | 340                              |

*Toronto branch—Continued.*

| Distance<br>from Hamil-<br>ton Station. | Localities.             | Elevation<br>above Lake<br>Ontario. | Elevation<br>above mean<br>tide. |
|-----------------------------------------|-------------------------|-------------------------------------|----------------------------------|
| <i>Miles.</i>                           |                         | <i>Feet.</i>                        | <i>Feet.</i>                     |
|                                         | Twelve-Mile creek:      |                                     |                                  |
| 12. 94                                  | Track .....             | 96                                  | 345                              |
| 12. 94                                  | Bed of creek .....      | 29                                  | 276                              |
| 13. 50                                  | Bronté station .....    | 99                                  | 346                              |
| 17. 07                                  | Bed of creek .....      | 6                                   | 253                              |
| 17. 51                                  | Oakville station .....  | 93                                  | 340                              |
| 20. 62                                  | .....                   | 104                                 | 351                              |
|                                         | Credit valley:          |                                     |                                  |
| 24. 46                                  | South side .....        | 36                                  | 283                              |
|                                         | Piles driven to .....   | —20                                 | 227                              |
| 25. 88                                  | North side .....        | 34                                  | 281                              |
| 29. 30                                  | Track .....             | 55                                  | 312                              |
| 29. 30                                  | Bed of valley .....     | 10                                  | 257                              |
| 32. 19                                  | Mimico station .....    | 60                                  | 307                              |
| 32. 69                                  | Mimico river, bed ..... | —2                                  | 245                              |
| 39. 00                                  | Toronto station .....   | 8                                   | 255                              |

G. W. R.—BRANTFORD AND TILSONBURG LINE.

| Distance<br>from Harris-<br>burg junc-<br>tion. | Localities.                            | Elevation<br>above Lake<br>Ontario. | Elevation<br>above mean<br>tide. |
|-------------------------------------------------|----------------------------------------|-------------------------------------|----------------------------------|
| <i>Miles.</i>                                   |                                        | <i>Feet.</i>                        | <i>Feet.</i>                     |
| 0. 00                                           | Harrisburg junction .....              | 487                                 | 734                              |
| 0. 75                                           | Fairchild's creek, bed .....           | 412                                 | 659                              |
| 7. 31                                           | G. T. R. crossing .....                | 439                                 | 686                              |
|                                                 | Brantford:                             |                                     |                                  |
| 8. 14                                           | Bridge over Grand river .....          | 412                                 | 659                              |
| 8. 14                                           | Bed of Grand river .....               | 396                                 | 645                              |
| 12. 60                                          | Mount Pleasant station .....           | 563                                 | 810                              |
| 15. 57                                          | Mount Vernon station .....             | 599                                 | 839                              |
| 17. 30                                          | Burford station .....                  | 597                                 | 844                              |
| 21. 00                                          | Harley station .....                   | 590                                 | 837                              |
| 28. 08                                          | Norwich station .....                  | 597                                 | 844                              |
| 34. 90                                          | Springford station .....               | 575                                 | 822                              |
|                                                 | Tilsonburg:                            |                                     |                                  |
| 39. 12                                          | Canada Southern railway crossing ..... | 550                                 | 797                              |
| 40. 25                                          | Station .....                          | 538                                 | 785                              |
| 42. 75                                          | Junction .....                         | .....                               | .....                            |

G. W. R.—SAENIA BRANCH.

| Distance<br>from Lon-<br>don. | Localities.              | Elevation<br>above Lake<br>Ontario. | Elevation<br>above mean<br>tide. |
|-------------------------------|--------------------------|-------------------------------------|----------------------------------|
| <i>Miles.</i>                 |                          | <i>Feet.</i>                        | <i>Feet.</i>                     |
| 0. 00                         | London station .....     | 559                                 | 806                              |
| 4. 22                         | Hyde Park junction ..... | 639                                 | 886                              |
| 10. 00                        | Komoka junction .....    | 575                                 | 822                              |

*Sarnia branch—Continued.*

| Distance<br>from Lon-<br>don. | Localities.                    | Elevation<br>above Lake<br>Ontario. | Elevation<br>above mean<br>time. |
|-------------------------------|--------------------------------|-------------------------------------|----------------------------------|
| <i>Miles.</i>                 |                                | <i>Feet.</i>                        | <i>Feet.</i>                     |
| 20. 23                        | Strathroy station .....        | 500                                 | 747                              |
|                               | Do. Sydenham river, bed .....  | 475                                 | 722                              |
| 33. 38                        | Watford station .....          | 540                                 | 787                              |
| 41. 81                        | Wanstead station .....         | 455                                 | 702                              |
| 45. 38                        | Wyoming station .....          | 465                                 | 712                              |
| 51. 10                        | Mandamin station .....         | 400                                 | 647                              |
| 60. 89                        | Sarnia (near lake Huron) ..... | 342                                 | 589                              |

## G. W. R.—LONDON AND PORT STANLEY BRANCH.

| Distance<br>from Port<br>Stanley. | Localities.                            | Elevation<br>above Lake<br>Ontario. | Elevation<br>above mean<br>tide. |
|-----------------------------------|----------------------------------------|-------------------------------------|----------------------------------|
| <i>Miles.</i>                     |                                        | <i>Feet.</i>                        | <i>Feet.</i>                     |
| 0. 00                             | Port Stanley, level of lake Erie ..... | 327                                 | 574                              |
| 3. 70                             | .....                                  | 443                                 | 690                              |
| 4. 55                             | Kettle Creek bridge .....              | 488                                 | 735                              |
| 7. 87                             | Saint Thomas station .....             | 511                                 | 758                              |
| 16. 18                            | Summit of track .....                  | 673                                 | 920                              |
| 23. 58                            | London.....                            | 567                                 | 814                              |

## G. W. R.—LONDON, HURON AND BRUCE BRANCH.

| Distance<br>from Lon-<br>don. | Localities.                 | Elevation<br>above Lake<br>Ontario. | Elevation<br>above mean<br>tide. |
|-------------------------------|-----------------------------|-------------------------------------|----------------------------------|
| <i>Miles.</i>                 |                             | <i>Feet.</i>                        | <i>Feet.</i>                     |
| 0. 00                         | London (Richmond st.) ..... | 559                                 | 806                              |
| 4. 22                         | Hyde Park junction .....    | 639                                 | 886                              |
| 11. 22                        | Ilderton station .....      | 690                                 | 937                              |
| 15. 58                        | Brecon station .....        | 653                                 | 900                              |
| 19. 22                        | Au Sable river, track ..... | 624                                 | 871                              |
|                               | Do. do. bed .....           | 598                                 | 845                              |
| 20. 69                        | Clandeboye station .....    | 641                                 | 888                              |
| 26. 50                        | Centralia station .....     | 620                                 | 867                              |
| 31. 11                        | Exeter station .....        | 628                                 | 875                              |
| 37. 17                        | Hensall station .....       | 652                                 | 899                              |
| 43. 23                        | Brucefield station .....    | 643                                 | 890                              |
| 50. 06                        | Clinton station .....       | 672                                 | 919                              |
| 56. 20                        | Maitland river, bed .....   | 695                                 | 942                              |
| 56. 86                        | Londesborough station ..... | 727                                 | 974                              |
| 60. 80                        | Blyth station .....         | 834                                 | 1,081                            |
| 62. 55                        | Summit .....                | 877                                 | 1,124                            |
| 67. 23                        | Belgrave station .....      | 815                                 | 1,063                            |
| 72. 06                        | Bed of valley .....         | 765                                 | 1,012                            |
| 74. 00                        | Wingham station .....       | 834                                 | 1,081                            |

*London, Huron and Bruce branch—Continued.*

| Distance<br>from Glen-<br>coe junc-<br>tion. | Localities.                                   | Elevation<br>above Lake<br>Ontario. | Elevation<br>above mean<br>tide. |
|----------------------------------------------|-----------------------------------------------|-------------------------------------|----------------------------------|
| <i>Miles.</i>                                |                                               | <i>Feet.</i>                        | <i>Feet.</i>                     |
| 0. 00                                        | Glencoe junction .....                        | 48.                                 | 728                              |
|                                              | Thames river:                                 |                                     |                                  |
| 11. 70                                       | Track .....                                   | 453                                 | 700                              |
| 11. 70                                       | Bed .....                                     | 383                                 | 630                              |
| 15. 20                                       | Lawrence (near) .....                         | 496                                 | 742                              |
|                                              | Kettle creek:                                 |                                     |                                  |
| 26. 75                                       | Bridge .....                                  | 500                                 | 747                              |
|                                              | Bed of .....                                  | 420                                 | 667                              |
| 28. 00                                       | St. Thomas (near) .....                       | 520                                 | 767                              |
| 37. 75                                       | Aylmer (near) .....                           | 514                                 | 761                              |
| 46. 20                                       | Corinth station .....                         | 520                                 | 767                              |
| 52. 00                                       | Otter creek, bed of .....                     | 404                                 | 651                              |
| 53. 25                                       | Tilsonburg (near) .....                       | 538                                 | 785                              |
| 56. 50                                       | Cortland (near) .....                         | 529                                 | 776                              |
|                                              | Big Creek:                                    |                                     |                                  |
| 63. 00                                       | Track .....                                   | 515                                 | 762                              |
| 63. 00                                       | Bed of .....                                  | 424                                 | 671                              |
| 64. 25                                       | Delhi (near) .....                            | 548                                 | 795                              |
| 73. 00                                       | Simcoe station .....                          | 472                                 | 719                              |
| 83. 50                                       | Jarvis station .....                          | 454                                 | 701                              |
| 92. 00                                       | .....                                         | 468                                 | 715                              |
| 96. 60                                       | Grand river bridge, near Cayuga station ..... | 368                                 | 615                              |
| 96. 60                                       | Bed of Grand river .....                      | 324                                 | 571                              |
| 103. 20                                      | G. T. R. crossing .....                       | 369                                 | 616                              |
| 123. 00                                      | Frank's creek .....                           | 328                                 | 575                              |
| 125. 75                                      | Welland canal feeder .....                    | 339                                 | 586                              |
| 128. 50                                      | Welland railway crossing .....                | 330                                 | 577                              |
| 138. 00                                      | Stevensville station .....                    | 345                                 | 592                              |
| 142. 75                                      | Erie and Niagara railway crossing .....       | 348                                 | 595                              |
| 145. 40                                      | Niagara river .....                           | 325                                 | 572                              |

WELLINGTON, GRAY AND BRUCE RAILWAY COMPANY, OPERATED BY  
THE G. W. R. CO.

| Distance<br>from Harris-<br>burg junc-<br>tion. | Localities.                                             | Elevation<br>above Lake<br>Ontario. | Elevation<br>above mean<br>tide. |
|-------------------------------------------------|---------------------------------------------------------|-------------------------------------|----------------------------------|
| <i>Miles.</i>                                   |                                                         | <i>Feet.</i>                        | <i>Feet.</i>                     |
| 0. 00                                           | Harrisburg, junction with main line of G.<br>W. R. .... | 487                                 | 734                              |
| 2. 40                                           | Fairchild's creek (Dumfries branch), track ..           | 513                                 | 760                              |
| 6. 13                                           | Branchton station .....                                 | 650                                 | 897                              |
| 11. 82                                          | Galt station .....                                      | 641                                 | 888                              |
| 16. 00                                          | Preston station .....                                   | 680                                 | 927                              |
| 17. 72                                          | Ballast Hill .....                                      | 718                                 | 965                              |
| 19. 07                                          | Speed river, track .....                                | 688                                 | 933                              |
| 19. 38                                          | Hespeler station .....                                  | 665                                 | 942                              |
| 27. 33                                          | Guelph station .....                                    | 832                                 | 1, 079                           |

*Wellington, Grey and Bruce railway—Continued.*

| Distance<br>from<br>Guelph. | Localities.                      | Elevation<br>above Lake<br>Ontario. | Elevation<br>above mean<br>tide. |
|-----------------------------|----------------------------------|-------------------------------------|----------------------------------|
| <i>Miles.</i>               |                                  | <i>Feet.</i>                        | <i>Feet.</i>                     |
| 0.00                        | Guelph station .....             | 832                                 | 1,078                            |
| 8.70                        | Hurst's creek, bed .....         | 902                                 | 1,149                            |
|                             | Swan creek:                      |                                     |                                  |
| 11.02                       | Track .....                      | 970                                 | 1,217                            |
| 11.02                       | Bed .....                        | 911                                 | 1,158                            |
| 13.31                       | Elora station .....              | 1,050                               | 1,297                            |
|                             | Do. Grand river:                 |                                     |                                  |
| 14.75                       | East side .....                  | 1,080                               | 1,327                            |
|                             | Bed .....                        | 992                                 | 1,239                            |
| 16.00                       | Fergus station .....             | 1,111                               | 1,358                            |
|                             | Irwine river:                    |                                     |                                  |
| 19.00                       | East side .....                  | 1,135                               | 1,382                            |
|                             | Bed .....                        | 1,074                               | 1,321                            |
| 24.60                       | Summit .....                     | 1,235                               | 1,482                            |
| 27.30                       | Goldstone station .....          | 1,214                               | 1,461                            |
| 31.10                       | Drayton station .....            | 1,147                               | 1,394                            |
| 35.00                       | Moorefield station .....         | 1,104                               | 1,351                            |
| 42.10                       | Palmerston station .....         | 1,067                               | 1,314                            |
| 47.80                       | Harriston station .....          | 1,017                               | 284                              |
| 54.23                       | Clifford station .....           | 967                                 | 1,234                            |
| 63.23                       | Mildmay station .....            | 783                                 | 1,030                            |
| 69.01                       | Walkerton station .....          | 686                                 | 933                              |
| 77.80                       | Pinkerton station .....          | 614                                 | 861                              |
| 84.29                       | Paisley station .....            | 529                                 | 776                              |
|                             | Teeswater river:                 |                                     |                                  |
| 84.61                       | Bed .....                        | 462                                 | 709                              |
| 84.61                       | Track over .....                 | 525                                 | 772                              |
| 97.00                       | Port Elgin station .....         | 428                                 | 675                              |
| 101.14                      | Southampton station .....        | 369                                 | 616                              |
| 101.30                      | Do. Lake Huron, Aug., 1872 ..... | 335                                 | 582                              |

## W. G. &amp; B. R.—SOUTH EXTENSION.

| Distance<br>from Pal-<br>merston. | Localities.                         | Elevation<br>above Lake<br>Ontario. | Elevation<br>above mean<br>tide. |
|-----------------------------------|-------------------------------------|-------------------------------------|----------------------------------|
| <i>Miles.</i>                     |                                     | <i>Feet.</i>                        | <i>Feet.</i>                     |
| 0.00                              | Palmerston station .....            | 1,067                               | 1,314                            |
| 5.62                              | Gowanstown station .....            | 1,038                               | 1,285                            |
| 8.71                              | Listowel station .....              | 1,016                               | 1,263                            |
| 14.68                             | Newry station .....                 | 957                                 | 1,204                            |
| 18.81                             | Henfryn siding .....                | 919                                 | 1,166                            |
| 21.78                             | Ethel station .....                 | 927                                 | 1,174                            |
| 27.35                             | Brussels station .....              | 875                                 | 1,122                            |
| 30.00                             | Gravel bed .....                    | 848                                 | 1,095                            |
| 34.15                             | Bluevale station .....              | 832                                 | 1,079                            |
| 35.00                             | Maitland river, bed .....           | 797                                 | 1,044                            |
| 37.22                             | Wingham station .....               | 835                                 | 1,082                            |
| 38.54                             | Maitland river, bed .....           | 757                                 | 1,004                            |
| 43.64                             | Kinloss (Whitechurch) station ..... | 799                                 | 1,046                            |
| 50.00                             | Lucknow station .....               | 663                                 | 910                              |
| 57.00                             | Pine river, bed .....               | 536                                 | 783                              |
| 58.18                             | Ripley siding .....                 | 560                                 | 807                              |
| 66.38                             | Kincardine station .....            | 343                                 | 590                              |
| 66.41                             | Kincardine, Lake Huron .....        | 335                                 | 582                              |

## WELLAND RAILWAY—OPERATED BY G. W. R.

| Localities.                          | Elevation<br>above Lake<br>Ontario. | Elevation<br>above mean<br>tide. |
|--------------------------------------|-------------------------------------|----------------------------------|
|                                      | <i>Feet.</i>                        | <i>Feet.</i>                     |
| Lake Ontario .....                   |                                     | 247                              |
| Saint Catherine's, old station ..... | 128                                 | 375                              |
| G. W. R. crossing .....              | 210                                 | 457                              |
| Thorold station .....                | 306                                 | 553                              |
| Allanburg station .....              | 345                                 | 592                              |
| Port Robinson station .....          | 342                                 | 589                              |
| Welland river bed .....              | 322                                 | 569                              |
| Welland station .....                | 355                                 | 602                              |
| Port Colborn station .....           | 339                                 | 586                              |
| Lake Erie .....                      | 330                                 | 577                              |

NOTE.—All the elevations along the Great Western railway and its branches were obtained from the various profiles, through the kindness of the chief engineer, and reduced to a common datum.

The elevations given are those of track when opposite the station; elsewhere those of the natural ground have been adopted. The above tables cover most undulations of surface ranging more than 20 or 30 feet in height.

## HAMILTON AND NORTHWESTERN RAILWAY.

| Distance<br>from Port<br>Dover. | Location.                             | Elevation<br>above Lake<br>Ontario. | Elevation<br>above mean<br>tide. |
|---------------------------------|---------------------------------------|-------------------------------------|----------------------------------|
| <i>Miles.</i>                   |                                       | <i>Feet.</i>                        | <i>Feet.</i>                     |
| 0. 00                           | Lake Erie, at Port Dover .....        | 328                                 | 575                              |
| 0. 15                           | .....                                 | 380                                 | 627                              |
| 8. 90                           | Jarvis, Loop Line crossing .....      | 452                                 | 699                              |
| 14. 80                          | .....                                 | 483                                 | 730                              |
| 15. 96                          | Hagersville (near) .....              | 449                                 | 696                              |
| 21. 00                          | .....                                 | 382                                 | 629                              |
| 23. 30                          | .....                                 | 438                                 | 685                              |
| 23. 56                          | Grand river at Seneca :               |                                     |                                  |
|                                 | South bank .....                      | 405                                 | 652                              |
|                                 | Bed .....                             | 365                                 | 622                              |
| 23. 75                          | North bank .....                      | 397                                 | 644                              |
| 24. 31                          | Seneca, crossing of plank road .....  | 406                                 | 653                              |
| 26. 90                          | .....                                 | 439                                 | 686                              |
| 28. 01                          | Chippewa creek .....                  | 424                                 | 671                              |
| 29. 69                          | Summit .....                          | 493                                 | 740                              |
| 34. 95                          | Brow of Niagara escarpment .....      | 396                                 | 643                              |
| 39. 18                          | Hamilton :                            |                                     |                                  |
|                                 | Wentworth street, south .....         | 130                                 | 377                              |
| 40. 00                          | Station (King street) .....           |                                     |                                  |
|                                 | Barton street .....                   | 30                                  | 277                              |
| 42. 00                          | Wentworth street, north .....         | 19                                  | 266                              |
| 48. 50                          | Burlington, beach (Ocean House) ..... | 8                                   | 255                              |
| 50. 00                          | ..... do..... station .....           | 6                                   | 253                              |
| 51. 50                          | ..... do..... G. W. R. crossing ..... | 71                                  | 318                              |
| 57. 40                          | .....                                 | 276                                 | 523                              |
| 63. 25                          | Milton station .....                  | 414                                 | 661                              |
| 76. 00                          | Georgetown (gravel bed) .....         | 644                                 | 891                              |
| 78. 50                          | Glen Williams .....                   | 663                                 | 910                              |
| 93. 00                          | Caledon (sand bed near) .....         | 696                                 | 942                              |

(467)



*Hamilton and Northwestern Railway—Continued.*

| Distance<br>from Port<br>Dover. | Location.                        | Elevation<br>above Lake<br>Ontario. | Elevation<br>above mean<br>tide. |
|---------------------------------|----------------------------------|-------------------------------------|----------------------------------|
| <i>Miles.</i>                   |                                  | <i>Feet.</i>                        | <i>Feet.</i>                     |
| 100.20                          | Summit north of Palgrave.....    | 722                                 | 969                              |
| 111.50                          | Beeton junction .....            | 469                                 | 716                              |
| 120.60                          | Everett station .....            | 549                                 | 796                              |
| 129.20                          | Glencairn station .....          | 491                                 | 738                              |
| 139.50                          | Summit.....                      | 805                                 | 1052                             |
| 143.00                          | Duntroon station .....           | 689                                 | 936                              |
| 147.60                          | Nottawa station .....            | 460                                 | 707                              |
| 150.20                          | Collingwood station .....        | 342                                 | 589                              |
|                                 | .....do.....lake Huron.....      | 331                                 | 578                              |
| 0.00                            | Beeton junction, on branch ..... | 469                                 | 716                              |
| 12.50                           | Thornton station .....           | 695                                 | 942                              |
| 14.00                           | Summit station .....             | 751                                 | 998                              |
| 22.30                           | Allandale station .....          | 508                                 | 755                              |
| 26.00                           | Barrie station .....             | 625                                 | 872                              |
|                                 | Barrie, Lake Simcoe.....         | 475                                 | 722                              |

NOTE.—South of Hamilton, elevations refer to original ground. North of Hamilton reference is to track.

## NORTHERN RAILWAY—MAIN LINE.

| Distance<br>from<br>Toronto. | Localities.                      | Elevation<br>above Lake<br>Ontario. | Elevation<br>above mean<br>tide. |
|------------------------------|----------------------------------|-------------------------------------|----------------------------------|
| <i>Miles.</i>                |                                  | <i>Feet.</i>                        | <i>Feet.</i>                     |
| 0.00                         | Lake Ontario, at Toronto.....    | 00                                  | 247                              |
| 7.00                         | Gravel pit .....                 | 204                                 | 451                              |
| 8.12                         | Weston station .....             | 337                                 | 584                              |
| 12.33                        | York station .....               | 425                                 | 672                              |
| 14.50                        | Thornhill station .....          | 386                                 | 633                              |
| 19.00                        | Richmond Hill (Gravel pit) ..... | 600                                 | 847                              |
| 22.75                        | King station .....               | 708                                 | 955                              |
| 26.60                        | Summit.....                      | 755                                 | 1,002                            |
| 34.30                        | Newmarket station .....          | 525                                 | 772                              |
| 38.00                        | Holland Landing .....            | 496                                 | 743                              |
| 41.00                        | .....do.river .....              | 478                                 | 725                              |
| 42.00                        | Bradford station .....           | 478                                 | 725                              |
| 44.50                        | Scanbons station .....           | 494                                 | 741                              |
| 49.00                        | Gilford station.....             | 506                                 | 753                              |
| 52.00                        | Lefroy station .....             | 532                                 | 779                              |
| 53.00                        | Gravel ridge.....                | 520                                 | 767                              |
| 57.00                        | Bramley station.....             | 641                                 | 888                              |
| 57.75                        | Craigvale station.....           | 632                                 | 879                              |
| 61.50                        | Thompson station.....            | 545                                 | 792                              |
| 62.50                        | Gravel pit .....                 | 520                                 | 767                              |
| 63.00                        | Allandale (near Barrie).....     | 491                                 | 736                              |
| 63.00                        | Lake Simcoe.....                 | 475                                 | 722                              |
| 68.75                        | Colwell junction .....           | 503                                 | 750                              |
| 72.75                        | Nottawasaga river .....          | 380                                 | 627                              |
| 73.50                        | Angus (Pine river) .....         | 380                                 | 627                              |
| 74.50                        | Gravel ridge .....               | 389                                 | 636                              |
| 77.60                        | Brentwood station .....          | 400                                 | 647                              |
| 80.00                        | Sunnidale station.....           | 375                                 | 622                              |
| 86.00                        | Stayner station .....            | 470                                 | 717                              |

*Northern Railway—Main Line—Continued.*

| Distance<br>from<br>Toronto. | Location.                     | Elevation<br>above Lake<br>Ontario. | Elevation<br>above<br>mean tide. |
|------------------------------|-------------------------------|-------------------------------------|----------------------------------|
| <i>Miles.</i>                |                               | <i>Feet.</i>                        | <i>Feet.</i>                     |
| 94.70                        | Collingwood station.....      | 343                                 | 590                              |
| 94.70                        | .....do..... Lake Huron ..... | 337                                 | 584                              |
| 100.00                       | Craigleith station.....       | 344                                 | 591                              |
| 106.10                       | Gravel pit .....              | 354                                 | 601                              |
| 107.00                       | Thornbury station .....       | 365                                 | 612                              |
| 112.00                       | Summit .....                  | 510                                 | 757                              |
| 115.00                       | Meaford station.....          | 427                                 | 674                              |

## NORTHERN RAILWAY—MUSKOKA BRANCH.

| Distance<br>from<br>Toronto. | Localities.                        | Elevation<br>above Lake<br>Ontario. | Elevation<br>above mean<br>tide. |
|------------------------------|------------------------------------|-------------------------------------|----------------------------------|
| <i>Miles.</i>                |                                    | <i>Feet.</i>                        | <i>Feet.</i>                     |
| 64.12                        | Barrie (Lake Simcoe).....          | 475                                 | 722                              |
| 64.20                        | .....do..... station .....         | 479                                 | 728                              |
| 66.30                        | Kempenfeldt.....                   | 510                                 | 757                              |
| 70.00                        | Gowan .....                        | 572                                 | 819                              |
| 71.20                        | Summit.....                        | 593                                 | 840                              |
| 78.20                        | Hawkestone .....                   | 532                                 | 779                              |
| 81.00                        | .....do.....                       | 575                                 | 822                              |
| 82.50                        | Gravel pit .....                   | 483                                 | 730                              |
| 88.30                        | Orillia .....                      | 479                                 | 726                              |
| 88.50                        | Narrows of Lake Couchouching.....  | 486                                 | 733                              |
| 94.00                        | Longford station .....             | 489                                 | 736                              |
| 95.00                        | .....                              | 519                                 | 766                              |
| 98.00                        | Severn river, east branch.....     | 483                                 | 730                              |
| 99.00                        | Washago .....                      | 482                                 | 729                              |
| 99.50                        | Severn river, west branch .....    | 485                                 | 732                              |
| 100.50                       | .....do..... station .....         | 478                                 | 725                              |
| 100.50                       | .....do..... station (water) ..... | 464                                 | 711                              |
| 100.70                       | .....do..... river .....           | .....                               | .....                            |
| 102.40                       | Gravel pit .....                   | 480                                 | 727                              |
| 104.40                       | .....                              | 369                                 | 616                              |
| 106.20                       | Lethbridge station.....            | 509                                 | 756                              |
| 108.00                       | Rock pass .....                    | 530                                 | 777                              |
| 109.30                       | Summit .....                       | 605                                 | 852                              |
| 111.30                       | Gravenhurst station .....          | 572                                 | 819                              |
| 112.40                       | Muskoka lake.....                  | 500                                 | 747                              |

## NORTHERN RAILWAY—PARRY SOUND BRANCH.

| Distance<br>from Colwell<br>junction. | Localities.                                    | Elevation<br>above Lake<br>Ontario. | Elevation<br>above mean<br>tide. |
|---------------------------------------|------------------------------------------------|-------------------------------------|----------------------------------|
| <i>Miles.</i>                         |                                                | <i>Feet.</i>                        | <i>Feet.</i>                     |
| 0.00                                  | Colwell junction (68.75 miles from Toronto)... | 503                                 | 750                              |
| 3.71                                  | .....                                          | 457                                 | 704                              |
| 4.15                                  | Sand pit .....                                 | 451                                 | 698                              |
| 7.58                                  | Minessing station .....                        | 372                                 | 619                              |
| 11.04                                 | Sand bed .....                                 | 490                                 | 737                              |
| 15.78                                 | Phelpston station .....                        | 477                                 | 724                              |
| 22.63                                 | Marsh, track over .....                        | 440                                 | 687                              |
| 25.95                                 | Wyeville station .....                         | 525                                 | 772                              |
| 30.36                                 | Summit of branch .....                         | 544                                 | 791                              |
| 35.61                                 | Penetanguishene station .....                  | 342                                 | 589                              |

The Hamilton and Northwestern Railway Company and the Northern Railway Company are now amalgamated. The levels of both roads were furnished through the kindness of Mr. Harry Holgate, assistant engineer of the united roads. The levels from Lake Erie to Hamilton, were obtained from the chief engineer during the construction before the stations were located. The altitudes of the stations on Northern Railway refer to track.

## TORONTO, GREY AND BRUCE RAILWAY.

| Distance<br>from<br>Toronto. | Localities.                                   | Elevation<br>above Lake<br>Ontario. | Elevation<br>above mean<br>tide. |
|------------------------------|-----------------------------------------------|-------------------------------------|----------------------------------|
| <i>Miles.</i>                |                                               | <i>Feet.</i>                        | <i>Feet.</i>                     |
| 0.00                         | Toronto station .....                         | 8                                   | 255                              |
| 2.25                         | ...do... Queen Street junction .....          | 57                                  | 304                              |
| 5.00                         | Carlton (sand and gravel bed) .....           | 160                                 | 407                              |
| 8.50                         | Weston station .....                          | 182                                 | 429                              |
| 14.00                        | Sand and gravel bed .....                     | 280                                 | 527                              |
|                              | Humber valley:                                |                                     |                                  |
| 14.50                        | East side .....                               | 268                                 | 515                              |
| 15.20                        | Bridge .....                                  | 224                                 | 471                              |
| 16.20                        | { West side .....                             |                                     |                                  |
|                              | { Woodbridge station .....                    | 311                                 | 558                              |
| 18.00                        | Sand and gravel bed .....                     | 370                                 | 617                              |
| 21.50                        | Kleinburg .....                               | 468                                 | 713                              |
| 26.30                        | Bolton station .....                          | 591                                 | 838                              |
| 32.75                        | Mono Road .....                               | 729                                 | 976                              |
| 34.00                        | Gravel bed .....                              | 710                                 | 957                              |
| 37.00                        | ...do. ....                                   | 990                                 | 1,237                            |
| 38.75                        | .....                                         | 1,130                               | 1,377                            |
| 41.25                        | Charleston station (gravel bed near by) ..... | 1,120                               | 1,367                            |
| 44.60                        | Alton station .....                           | 1,051                               | 1,298                            |
| 48.60                        | Orangeville station .....                     | 1,151                               | 1,398                            |
| 52.50                        | ...do ... junction .....                      | 1,369                               | 1,616                            |
| 58.00                        | Sand and gravel bed .....                     | 1,340                               | 1,587                            |
| 64.50                        | Shelburne station .....                       | 1,382                               | 1,629                            |
| 75.80                        | Dundalk station .....                         | 1,454                               | 1,701                            |
| 76.20                        | Summit .....                                  | 1,462                               | 1,709                            |
| 81.00                        | Proton station .....                          | 1,366                               | 1,613                            |
| 86.00                        | Flesherton (adjacent sand and gravel bed) ... | 1,310                               | 1,557                            |
| 93.00                        | Markdale station .....                        | 1,112                               | 1,359                            |
| 98.00                        | Berkley station .....                         | 1,082                               | 1,329                            |

*Toronto, Grey and Bruce Railway—Continued.*

| Distance<br>from<br>Toronto. | Localities.                              | Elevation<br>above Lake<br>Ontario. | Elevation<br>above mean<br>tide. |
|------------------------------|------------------------------------------|-------------------------------------|----------------------------------|
| <i>Miles.</i>                |                                          | <i>Feet.</i>                        | <i>Feet.</i>                     |
| 100.00                       | Gravel (deposits for several miles)..... | 1,000                               | 1,247                            |
| 102.00                       | Williamsford station .....               | 965                                 | 1,212                            |
| 108.80                       | Speed river .....                        | 700                                 | 947                              |
| 109.00                       | Chatsworth station (gravel beds) .....   | 697                                 | 944                              |
| 111.00                       | Sydenham river .....                     | 690                                 | 937                              |
| 114.20                       | Rockford station .....                   | 655                                 | 912                              |
|                              | Owen sound:                              |                                     |                                  |
| 120.80                       | Station.....                             | 339                                 | 586                              |
|                              | Georgian bay .....                       | 335                                 | 582                              |

## ALONG WEST BRANCH.

|        |                                          |       |       |
|--------|------------------------------------------|-------|-------|
| 52.60  | Orangeville junction .....               | 1,369 | 1,616 |
| 56.50  | Amaranth station (sand and gravel) ..... | 1,299 | 1,546 |
| 58.50  | Waldemar station .....                   | 1,248 | 1,495 |
| 61.80  | Luther station .....                     | 1,297 | 1,544 |
| 68.70  | Summit .....                             | 1,332 | 1,579 |
| 72.50  | Arthur .....                             | 1,278 | 1,525 |
| 79.00  | Kenilworth .....                         | 1,239 | 1,486 |
| 84.00  | Sand and gravel bed .....                | 1,130 | 1,377 |
| 86.00  | do .....                                 | 1,130 | 1,377 |
| 87.00  | Mount Forest station .....               | 1,103 | 1,350 |
| 91.00  | Page station .....                       | 1,036 | 1,283 |
| 94.70  | Harriston station .....                  | 999   | 1,246 |
| 103.00 | Fordwich station .....                   | 953   | 1,200 |
| 108.00 | Gorrie and Wroxeter station .....        | 876   | 1,123 |
| 110.00 | Sand and gravel beds .....               | 850   | 1,097 |
| 120.00 | Teeswater station .....                  | 777   | 1,024 |

Elevations, referring to track, were furnished through the kindness of Edmund Wragg, Esq., chief engineer and general manager of the railroad.

## CREDIT VALLEY RAILROAD.

|       |                                   |     |       |
|-------|-----------------------------------|-----|-------|
| 0.00  | Toronto station .....             | 8   | 255   |
| 6.80  | Lambton station .....             | 165 | 412   |
| 9.90  | Humber river bed .....            | 153 | 400   |
| 14.20 | Cooksville station (gravel) ..... | 146 | 393   |
| 17.40 | Streetsville station .....        | 252 | 499   |
| 20.40 | do .....                          | 306 | 553   |
| 32.10 | Milton station .....              | 416 | 663   |
| 38.70 | Campbellville station .....       | 682 | 929   |
| 51.70 | do .....                          | 760 | 1,007 |
| 57.20 | Galt station .....                | 689 | 936   |
| 57.20 | Galt, bed of Grand river .....    | 616 | 863   |
| 67.20 | Ayr station .....                 | 718 | 965   |
| 72.10 | Wolverton station .....           | 715 | 962   |
| 74.30 | Drumbo station .....              | 766 | 1,013 |
| 78.60 | Blandford station .....           | 725 | 972   |
| 81.60 | Innerhip station .....            | 725 | 972   |
| 87.80 | Woodstock station .....           | 700 | 947   |

## ORANGEVILLE AND ELORA BRANCH.

| Distance<br>from<br>Toronto. | Localities.                         | Elevation<br>above Lake<br>Ontario. | Elevation<br>above mean<br>tide. |
|------------------------------|-------------------------------------|-------------------------------------|----------------------------------|
| <i>Miles.</i>                |                                     | <i>Feet.</i>                        | <i>Feet.</i>                     |
| 21.60                        | Streetsville junction .....         | 305                                 | 552                              |
| 23.60                        | Meadsville station .....            | 319                                 | 566                              |
| 29.10                        | Brampton station .....              | 477                                 | 724                              |
| 45.50                        | Forks of the Credit .....           | 218                                 | 1,068                            |
|                              | Credit river:                       |                                     |                                  |
| 46.25                        | Bridge .....                        | 861                                 | 1,108                            |
| 46.25                        | Bed .....                           | 761                                 | 1,008                            |
| 48.20                        | Elora junction (Church Falls) ..... | 1,013                               | 1,260                            |
| 56.50                        | Orangeville .....                   | 1,111                               | 1,358                            |
| 48.20                        | Elora junction .....                | 1,013                               | 1,260                            |
| 52.90                        | Erin station .....                  | 1,048                               | 1,295                            |
| 56.60                        | Hillsburg station .....             | 1,177                               | 1,424                            |
| 61.10                        | Garafraxa station .....             | 1,205                               | 1,452                            |
| 64.50                        | Summit station .....                | 1,286                               | 1,533                            |
| 73.20                        | Fergus station .....                | 1,110                               | 1,357                            |
| 75.70                        | Elora station .....                 | 1,054                               | 1,301                            |

The above levels were kindly furnished by H. S. Holt, Esq., chief engineer.

## CANADA SOUTHERN RAILWAY.

| Distance<br>from<br>Buffalo. | Localities.                                     | Elevation<br>above Lake<br>Erie. | Elevation<br>above mean<br>tide. |
|------------------------------|-------------------------------------------------|----------------------------------|----------------------------------|
| <i>Miles.</i>                |                                                 | <i>Feet.</i>                     | <i>Feet.</i>                     |
| 0.00                         | Niagara river at Buffalo, September, 9, 1870.   | 00                               | 573                              |
| 0.11                         | Fort Erie station .....                         | 24                               | 597                              |
| 0.90                         | Victoria station .....                          | 34                               | 607                              |
| 2.22                         | Erie and Niagara railway junction .....         | 35                               | 608                              |
| 6.52                         | Black creek bed .....                           | — 5                              | 568                              |
| 7.22                         | Stevensville station .....                      | 16                               | 589                              |
| 14.20                        | Brookfield .....                                | 37                               | 610                              |
| 17.51                        | Welland station .....                           | 16                               | 589                              |
| 17.69                        | do canal bed (1880) .....                       | —11                              | 562                              |
| 22.50                        | .....                                           | 15                               | 558                              |
| 23.10                        | Forks creek, bed .....                          | —12                              | 561                              |
| 26.50                        | Perry's station .....                           | 17                               | 590                              |
| 34.91                        | Attercliff station .....                        | 18                               | 591                              |
| 42.31                        | Canfield (G. T. R. crossing) .....              | 48                               | 621                              |
| 64.12                        | .....                                           | 92                               | 665                              |
| 48.80                        | Dean's station .....                            | 64                               | 637                              |
| 49.53                        | Grand river, bed .....                          | 8                                | 581                              |
| 50.50                        | Decew's pond, bed .....                         | 27                               | 600                              |
| 55.49                        | .....                                           | 125                              | 698                              |
| 58.62                        | Hagersville station .....                       | 167                              | 740                              |
| 66.49                        | Villa Nova station .....                        | 159                              | 732                              |
| 68.56                        | Surface of ground .....                         | 182                              | 755                              |
| 68.57                        | Nanticoke creek bed .....                       | 145                              | 718                              |
| 71.38                        | Waterford station .....                         | 190                              | 763                              |
| 77.80                        | Windham station .....                           | 244                              | 817                              |
| 82.10                        | Pt. Dover and Lake Huron railway crossing ..... | 219                              | 792                              |
| 83.33                        | Hawtrey .....                                   | 213                              | 786                              |
| 88.00                        | Otter creek bed .....                           | 159                              | 732                              |
| 88.43                        | Cornell station .....                           | 224                              | 797                              |
| 93.80                        | Tilsonburg station .....                        | 233                              | 806                              |
| 105.19                       | Springfield station .....                       | 223                              | 796                              |

*Canada Southern Railway—Continued.*

| Distance<br>from<br>Buffalo. | Localities.                    | Elevation<br>above Lake<br>Erie. | Elevation<br>above mean<br>tide. |
|------------------------------|--------------------------------|----------------------------------|----------------------------------|
| <i>Miles.</i>                |                                | <i>Feet.</i>                     | <i>Feet.</i>                     |
| 112. 01                      | Cat Fish creek .....           | 141                              | 714                              |
| 118. 29                      | Saint Thomas station .....     | 193                              | 766                              |
| 119. 66                      | Kettle creek bed .....         | 92                               | 666                              |
| 119. 75                      | Surface of ground .....        | 184                              | 757                              |
| 122. 20                      | Saint Clair junction .....     | 192                              | 765                              |
| 127. 27                      | Shedden station .....          | 153                              | 726                              |
| 131. 17                      | Iona station .....             | 172                              | 745                              |
| 143. 61                      | Bismarck station .....         | 138                              | 711                              |
| 148. 10                      | Rodney station .....           | 120                              | 693                              |
| 151. 40                      | Taylor station .....           | 150                              | 723                              |
| 154. 10                      | Muirkirk station .....         | 152                              | 725                              |
| 156. 23                      | Highgate station .....         | 166                              | 739                              |
| 161. 82                      | Ridgetown station .....        | 87                               | 660                              |
| 168. 00                      | Harwich station .....          | 78                               | 651                              |
| 175. 20                      | Charing Cross station .....    | 55                               | 628                              |
| 181. 40                      | Buxton station .....           | 29                               | 602                              |
| 185. 41                      | Fletcher station .....         | 26                               | 599                              |
| 192. 50                      | Tilbury station .....          | 19                               | 592                              |
| 195. 00                      | Baptist creek .....            | 9                                | 582                              |
| 199. 00                      | Comber station .....           | 31                               | 604                              |
| 207. 90                      | Woodslee station .....         | 46                               | 619                              |
| 213. 50                      | Essex Center station .....     | 73                               | 646                              |
| 221. 40                      | Colchester station .....       | 38                               | 611                              |
| 227. 00                      | Canard river bed .....         | 12                               | 585                              |
| 228. 80                      | Amherstburg, top of bank ..... | 27                               | 600                              |
| 229. 20                      | Detroit river .....            | 7                                | 580                              |

## CANADA SOUTHERN RAILWAY—SARNIA BRANCH.

| Distance<br>from<br>St. Thomas. | Localities.                              | Elevation<br>above Lake<br>Erie. | Elevation<br>above mean<br>tide. |
|---------------------------------|------------------------------------------|----------------------------------|----------------------------------|
| <i>Miles.</i>                   |                                          | <i>Feet.</i>                     | <i>Feet.</i>                     |
| 0. 00                           | Saint Thomas station .....               | 193                              | 766                              |
| 3. 80                           | Saint Clair junction .....               | 192                              | 765                              |
| 5. 30                           | Loop line (S. W. R.) crossing .....      | 174                              | 747                              |
| 9. 10                           | Southwald station .....                  | 172                              | 745                              |
| 12. 20                          | Thames river:                            |                                  |                                  |
|                                 | East bank .....                          | 146                              | 719                              |
|                                 | Bed .....                                | 75                               | 648                              |
| 12. 50                          | West bank at Delaware station .....      | 157                              | 730                              |
| 19. 20                          | Melbourne station .....                  | 162                              | 73                               |
| 20. 20                          | G. W. R. crossing .....                  | 173                              | 746                              |
| 25. 40                          | Ekfrid station .....                     | 177                              | 750                              |
| 31. 30                          | Walker's station .....                   | 159                              | 732                              |
| 35. 10                          | West bank of Sydenham river .....        | 160                              | 733                              |
| 40. 70                          | Inwood station .....                     | 118                              | 691                              |
| 48. 00                          | Oil City station .....                   | 90                               | 663                              |
| 49. 10                          | Fox Creek bed .....                      | 65                               | 638                              |
| 56. 70                          | Brigden station .....                    | 63                               | 636                              |
| 57. 40                          | Bear Creek bed .....                     | 18                               | 591                              |
| 66. 40                          | Courtright .....                         | 11                               | 584                              |
|                                 | .... do. .... at Saint Clair river ..... |                                  |                                  |

The elevations of the Canada Southern railway were furnished through the kindness of W. B. Gossage, Esq., chief engineer of the C. S. R., in 1881.

## GRAND TRUNK RAILWAY—BRANTFORD AND GODERICH DISTRICT.

| Distance<br>from<br>Int. Bridge. | Localities.                                        | Elevation<br>above Lake<br>Ontario. | Elevation<br>above mean<br>tide. |
|----------------------------------|----------------------------------------------------|-------------------------------------|----------------------------------|
| <i>Miles.</i>                    |                                                    | <i>Feet.</i>                        | <i>Feet.</i>                     |
| 0.00                             | International Bridge .....                         | 341                                 | 588                              |
| 1.75                             | Niagara river surface .....                        | 320                                 | 567                              |
| 10.00                            | Fort Erie station .....                            | 359                                 | 606                              |
| 20.00                            | Bertie station .....                               | 371                                 | 618                              |
| 33.00                            | Port Colborne station .....                        | 334                                 | 581                              |
| 38.88                            | Welland canal feeder bridge .....                  | 339                                 | 586                              |
| 46.25                            | Dunville station .....                             | 338                                 | 585                              |
| 52.00                            | Canfield junction Crossing .....                   | 369                                 | 616                              |
| 59.38                            | Cook's station .....                               | 396                                 | 643                              |
| 62.75                            | Seneca (Caledonia) station .....                   | 411                                 | 658                              |
| 64.75                            | .....                                              | 434                                 | 681                              |
| 69.50                            | Big creek bed .....                                | 370                                 | 617                              |
| 75.00                            | Onondaga station .....                             | 417                                 | 664                              |
| 76.00                            | .....                                              | 484                                 | 731                              |
| 71.38                            | G. W. R. crossing .....                            | 441                                 | 688                              |
| 81.50                            | Brantford station .....                            | 459                                 | 706                              |
| 83.50                            | .....                                              | 609                                 | 856                              |
|                                  | Grand river:                                       |                                     |                                  |
|                                  | Bed .....                                          | 568                                 | 815                              |
|                                  | Bridge .....                                       | 485                                 | 732                              |
| 84.25                            | Paris station .....                                | 596                                 | 843                              |
| 87.00                            | .....                                              | 663                                 | 910                              |
| 88.38                            | Nith's creek bed .....                             | 589                                 | 836                              |
| 93.38                            | Summit near Drumbo .....                           | 777                                 | 1,024                            |
| 98.25                            | Bright station .....                               | 794                                 | 1,041                            |
| 108.00                           | Tavistock station .....                            | 890                                 | 1,137                            |
| 115.75                           | Stratford station .....                            | 943                                 | 1,190                            |
| 120.75                           | .....do.... bed of Avon river .....                | 892                                 | 1,139                            |
| 120.75                           | Sebringville station .....                         | 926                                 | 1,173                            |
| 123.12                           | Summit .....                                       | 966                                 | 1,213                            |
| 128.75                           | Mitchell station .....                             | 875                                 | 1,122                            |
| 133.63                           | Dublin station .....                               | 857                                 | 1,104                            |
| 140.25                           | Seaforth station .....                             | 762                                 | 1,009                            |
| 148.38                           | Clinton station .....                              | 674                                 | 921                              |
| 153.25                           | .....                                              | 670                                 | 917                              |
| 161.25                           | Goderich station .....                             | 483                                 | 730                              |
| 163.00                           | .....do.... (elevation near surface of Lake Huron) | 338                                 | 585                              |

## GRAND TRUNK RAILWAY—WESTERN DIVISION.

| Distance<br>from<br>Montreal. | Localities.               | Elevation<br>above Lake<br>Ontario. | Elevation<br>above mean<br>tide. |
|-------------------------------|---------------------------|-------------------------------------|----------------------------------|
| <i>Miles.</i>                 |                           | <i>Feet.</i>                        | <i>Feet.</i>                     |
| 333.00                        | Toronto station .....     | 8                                   | 255                              |
| 338.12                        | Carlton station .....     | 159                                 | 406                              |
| 341.38                        | Weston station .....      | 179                                 | 426                              |
| 342.50                        | Humber bridge .....       | 211                                 | 458                              |
| 342.50                        | .....do.... river .....   | 142                                 | 389                              |
| 346.50                        | Mimico bridge .....       | 293                                 | 540                              |
| 346.50                        | .....do.... river .....   | 265                                 | 512                              |
| 348.12                        | Malton station .....      | 303                                 | 550                              |
| 353.75                        | Etobicoke river bed ..... | 443                                 | 690                              |

*Grand Trunk Railway—Western Division—Continued.*

| Distance<br>from<br>Montreal. | Localities.                                  | Elevation<br>above Lake<br>Ontario. | Elevation<br>above mean<br>tide. |
|-------------------------------|----------------------------------------------|-------------------------------------|----------------------------------|
| <i>Miles.</i>                 |                                              | <i>Feet.</i>                        | <i>Feet.</i>                     |
| 354.12                        | Brampton station .....                       | 466                                 | 713                              |
| 359.63                        | Norval station .....                         | 572                                 | 819                              |
| 361.25                        | Credit bridge .....                          | 581                                 | 828                              |
| 361.25                        | .....do...river .....                        | 467                                 | 714                              |
| 362.00                        | Georgetown station .....                     | 600                                 | 847                              |
| 362.75                        | .....do...junction (H. & N. W. Ry.) .....    | 627                                 | 874                              |
| 365.25                        | Limehouse station .....                      | 810                                 | 1,057                            |
| 366.75                        | .....do...siding .....                       | 847                                 | 1,094                            |
| 368.38                        | Acton station .....                          | 912                                 | 1,159                            |
| 372.63                        | .....do... .....                             | 972                                 | 1,219                            |
| 373.75                        | Eremosa river (water) .....                  | 894                                 | 1,141                            |
| 374.00                        | Rockwood station .....                       | 936                                 | 1,183                            |
| 381.25                        | Speed river bed .....                        | 783                                 | 1,030                            |
| 381.38                        | Guelph station .....                         | 821                                 | 1,068                            |
| 386.50                        | Mosboro station .....                        | 838                                 | 1,085                            |
| 391.00                        | Breslau station .....                        | 778                                 | 1,025                            |
| 391.50                        | Grand river bed .....                        | 714                                 | 961                              |
| 395.38                        | Berlin station .....                         | 854                                 | 1,101                            |
| 397.12                        | Waterloo station .....                       | 811                                 | 1,058                            |
| 396.00                        | Summit .....                                 | 869                                 | 1,116                            |
| 395.88                        | Berlin junction .....                        | 848                                 | 1,095                            |
| 401.75                        | .....do... .....                             | 730                                 | 977                              |
| 404.38                        | Bridge near Blair .....                      | 653                                 | 900                              |
| 408.50                        | Galt station .....                           | 633                                 | 880                              |
| 401.75                        | Petersburg station .....                     | 964                                 | 1,211                            |
| 402.88                        | .....do...summit .....                       | 1,002                               | 1,249                            |
| 405.12                        | Baden station .....                          | 910                                 | 1,157                            |
| 407.62                        | Hamburg station .....                        | 880                                 | 1,127                            |
| 408.25                        | Nith river, bed .....                        | 836                                 | 1,083                            |
| 414.75                        | Shakespeare station .....                    | 937                                 | 1,184                            |
| 420.50                        | Port Dover and Lake Huron Ry. Crossing ..... | 947                                 | 1,194                            |
| 421.25                        | Stratford station .....                      | 943                                 | 1,190                            |
| 426.38                        | Saint Paul's station .....                   | 919                                 | 1,166                            |
| 431.38                        | Saint Mary's station .....                   | 836                                 | 1,083                            |
| 431.38                        | London Branch junction .....                 | 836                                 | 1,083                            |
| 444.50                        | Thorndale station .....                      | 689                                 | 936                              |
| 454.00                        | London station .....                         | 568                                 | 815                              |
| 432.25                        | Thames river (water) .....                   | 741                                 | 988                              |
| 438.00                        | Fish creek (bed) .....                       | 698                                 | 945                              |
| 440.75                        | Granton station .....                        | 787                                 | 1,034                            |
| 446.62                        | Lucan station .....                          | 744                                 | 991                              |
| 453.75                        | Ailsa Craig station .....                    | 507                                 | 754                              |
| 461.50                        | Parkhill station .....                       | 416                                 | 663                              |
| 467.75                        | Au Sable bridge .....                        | 370                                 | 617                              |
| 467.75                        | .....do...river (bed) .....                  | 347                                 | 594                              |
| 470.00                        | Widder station .....                         | 435                                 | 682                              |
| 473.50                        | Tool's Creek bridge .....                    | 476                                 | 723                              |
| 478.88                        | Forrest station .....                        | 465                                 | 712                              |
| 488.00                        | Camalachie station .....                     | 402                                 | 649                              |
| 492.25                        | Perch station .....                          | 348                                 | 595                              |
| 496.25                        | Blackwell station .....                      | 355                                 | 602                              |
| 501.50                        | Sarnia station .....                         | 340                                 | 587                              |
|                               | .....do...(water in St. Clair river) .....   | 335                                 | 582                              |



*Grand Trunk Railway—Western Division—Continued.*

| Distance<br>from Port<br>Huron. | Localities.                           | Elevation<br>above Lake<br>Ontario. | Elevation<br>above mean<br>tide. |
|---------------------------------|---------------------------------------|-------------------------------------|----------------------------------|
| <i>Miles.</i>                   | IN MICHIGAN.                          | <i>Feet.</i>                        | <i>Feet.</i>                     |
| 505.63                          | Port Huron station.....               | 341                                 | 588                              |
| 523.00                          | Chicago and Grand Trunk junction..... | 376                                 | 623                              |
| 528.88                          | Michigan Air-Line junction.....       | 476                                 | 723                              |
| 540.50                          | New Haven.....                        | 382                                 | 629                              |
| 552.00                          | Clinton river (water).....            | 326                                 | 573                              |
| 561.00                          | Connois river (water).....            | 361                                 | 608                              |
|                                 | Detroit junction.....                 | 347                                 | 594                              |

## GRAND TRUNK RAILWAY—CENTRAL DIVISION.

| Distance.<br>from Mont-<br>real. | Localities.                                | Elevation<br>above Lake<br>Saint Peter. | Elevation<br>above mean<br>tide. |
|----------------------------------|--------------------------------------------|-----------------------------------------|----------------------------------|
| <i>Miles.</i>                    |                                            | <i>Feet.</i>                            | <i>Feet.</i>                     |
| *0.00                            | Montreal (crossing Wellington street)..... | 40                                      | 51                               |
| 14.50                            | Point Clair station.....                   | 98                                      | 109                              |
| 20.50                            | Saint Anne station.....                    | 113                                     | 124                              |
| 24.00                            | Vaudreuil station.....                     | 82                                      | 93                               |
| 37.50                            | Coteau Landing station.....                | 150                                     | 161                              |
| 43.12                            | Rivière Baudette station.....              | 162                                     | 173                              |
| 45.00                            | Interprovincial line.....                  | 160                                     | 171                              |
| 53.75                            | Lancaster station.....                     | 154                                     | 165                              |
| 67.38                            | Cornwall station.....                      | 181                                     | 192                              |
| 81.50                            | Farran's Point station.....                | 231                                     | 242                              |
| 99.00                            | Iroquois station.....                      | 232                                     | 243                              |
| 104.38                           | Edwardsburg (Cardinal) station.....        | 266                                     | 277                              |
| 112.12                           | Prescott junction.....                     | 292                                     | 303                              |
| 113.50                           | ....do... station.....                     | 299                                     | 310                              |
| 125.25                           | Brockville station.....                    | 270                                     | 281                              |
| 129.50                           | Lynn station.....                          | 275                                     | 286                              |
| 133.00                           | Mallorytown station.....                   | 325                                     | 336                              |
| 146.12                           | Lansdown station.....                      | 323                                     | 334                              |
| 155.00                           | Ganonoque station.....                     | 250                                     | 261                              |
| 162.50                           | Ballantyne's station.....                  | 350                                     | 361                              |
| 168.38                           | Rideau station.....                        | 292                                     | 303                              |
| 172.63                           | Kingstown station.....                     | 263                                     | 274                              |
| 197.00                           | .....                                      | 359                                     | 370                              |
| 198.50                           | Napanee river (water).....                 | 266                                     | 277                              |
| 206.63                           | Tyendinaga station.....                    | 325                                     | 336                              |
| 220.25                           | Belleville station.....                    | 275                                     | 286                              |
| 220.62                           | ....do... Moira river (water).....         | 256                                     | 267                              |
| 231.88                           | Trent river (water).....                   | 238                                     | 249                              |
| 232.12                           | Trenton station.....                       | 254                                     | 265                              |
| 241.50                           | Brighton station.....                      | 293                                     | 304                              |
| 245.00                           | The Dangers.....                           | 259                                     | 270                              |
| 249.00                           | Colborne station.....                      | 311                                     | 322                              |
| 263.50                           | Colbourg station.....                      | 286                                     | 297                              |
| 270.25                           | Port Hope station.....                     | 276                                     | 287                              |
| 278.00                           | Newtonville station.....                   | 283                                     | 294                              |
| 288.88†                          | Newcastle station.....                     | 285                                     | 296                              |
| 290.25                           | Bowmansville station.....                  | 252                                     | 263                              |
| 293.25                           | .....                                      | 369                                     | 380                              |

*Grand Trunk Railway—Central Division—Continued.*

| Distance<br>from Mont-<br>real. | Localities.                  | Elevation<br>above Lake<br>Saint Peter. | Elevation<br>above mean<br>tide. |
|---------------------------------|------------------------------|-----------------------------------------|----------------------------------|
| <i>Miles.</i>                   |                              | <i>Feet.</i>                            | <i>Feet.</i>                     |
| 299.50                          | Oshawa station .....         | 322                                     | 333                              |
| 303.50                          | Whithy station .....         | 257                                     | 268                              |
| 309.75                          | Duffin's Creek station ..... | 276                                     | 287                              |
| 316.50                          | Port Union station .....     | 255                                     | 266                              |
| 323.38                          | Summit .....                 | 547                                     | 558                              |
| 324.00?                         | Scarboro junction .....      | 535                                     | 546                              |
| 331.38                          | Don creek (bridge) .....     | 242                                     | 253                              |
| 333.00                          | Toronto station .....        | 243                                     | 254                              |
| .....                           | do..... Lake Ontario .....   | 235                                     | 246                              |

## GRAND TRUNK RAILWAY—EASTERN DIVISION.

|        |                                                                       |       |       |
|--------|-----------------------------------------------------------------------|-------|-------|
| 0.00   | Montreal :                                                            |       |       |
|        | Point Saint Charles .....                                             | 40    | 51    |
|        | Center of Victoria bridge .....                                       | 104   | 115   |
|        | Saint Lawrence river (beneath Victoria<br>bridge) .....               | 22    | 33    |
| 6.50   | Saint Lambert's junction .....                                        | 65    | 76    |
| 10.00  | Saint Hubert's station .....                                          | 80    | 91    |
| 14.88  | Saint Bruno station .....                                             | 87    | 98    |
| 21.12  | Belœil station .....                                                  | 52    | 63    |
| 21.12  | do .. Richelieu river (surface) .....                                 | 37    | 48    |
| 22.25  | Saint Hilaire station .....                                           | 75    | 86    |
| 28.12  | Saint Madeleine station .....                                         | 108   | 119   |
| 35.62  | Saint Hyacinthe station .....                                         | 100   | 111   |
| 36.12  | Yomaska river (bed) .....                                             | 54    | 65    |
| 42.62  | Britannia Mills station .....                                         | 211   | 222   |
| 48.00  | Upton station .....                                                   | 193   | 204   |
|        | do .. Black river (surface) .....                                     | 156   | 167   |
| 54.38  | Acton station .....                                                   | 301   | 312   |
| 54.75  | Southeastern Railway junction .....                                   | 310   | 321   |
| 59.75  | Moose river (surface) .....                                           | 330   | 341   |
| 62.00  | Danby station .....                                                   | 427   | 438   |
| 66.12  | South Durham station .....                                            | 598   | 609   |
| 69.12  | Lisgar station .....                                                  | 518   | 529   |
| 74.75  | Saint Francis river (surface) .....                                   | 466   | 477   |
| 76.50  | Richmond station .....                                                | 380   | 391   |
| 86.38  | Windsor station .....                                                 | 409   | 420   |
| 94.50  | Brompton Falls station .....                                          | 460   | 471   |
| 100.75 | Magog river .....                                                     | 452   | 463   |
| 101.12 | Sherbrooke station .....                                              | 475   | 486   |
| 104.13 | Lennoxville station .....                                             | 489   | 500   |
| 111.12 | Waterville station .....                                              | 635   | 646   |
| 114.37 | Compton station .....                                                 | 723   | 734   |
| 117.13 | Richby station .....                                                  | 808   | 819   |
| 122.50 | Coaticoke station .....                                               | 996   | 1,007 |
| 127.62 | Dixville station .....                                                | 1,116 | 1,127 |
| 132.50 | International boundary (Canada and the<br>United States) .....        | 1,340 | 1,351 |
| 137.00 | Lake station, Vermont .....                                           | 1,241 | 1,252 |
| 141.25 | Summit, Vermont .....                                                 | 1,367 | 1,378 |
| 147.88 | Island Pond station, Vermont .....                                    | 1,176 | 1,187 |
| 155.25 | Wenlock station, Vermont .....                                        | 1,140 | 1,151 |
| 162.75 | Connecticut River Bed, New Hampshire and<br>Vermont, State Line ..... | 862   | 873   |
| 162.88 | North Stratford, New Hampshire .....                                  | 897   | 908   |
| 166.50 | Beathes, New Hampshire .....                                          | 865   | 876   |

*Grand Trunk Railway—Eastern Division—Continued.*

| Distance.<br>from Mont-<br>real. | Localities.                                 | Elevation<br>above Lake<br>Saint Peter. | Elevation<br>above mean<br>tide. |
|----------------------------------|---------------------------------------------|-----------------------------------------|----------------------------------|
| <i>Miles.</i>                    |                                             | <i>Feet.</i>                            | <i>Feet.</i>                     |
| 170. 87                          | Stratford Hollow station, New Hampshire.... | 858                                     | 869                              |
| 174. 38                          | Grovetown junction, New Hampshire .....     | 578                                     | 889                              |
| 180. 25                          | River Ammonoosuc (bed) New Hampshire....    | 943                                     | 954                              |
| 180. 87                          | Stark station, New Hampshire .....          | 949                                     | 960                              |
| 190. 00                          | West Milan (bed) New Hampshire .....        | 992                                     | 1, 103                           |
| 195. 75                          | Milan, water station, New Hampshire .....   | 1, 055                                  | 1, 066                           |
| 202. 38                          | Berlin Falls station, New Hampshire, .....  | 1, 011                                  | 1, 022                           |
| 207. 75                          | Gorham station, New Hampshire.....          | 787                                     | 798                              |
| 211. 50                          | Shelburne station, New Hampshire .....      | 698                                     | 709                              |
| 217. 75                          | Gilead station, Maine.....                  | 705                                     | 716                              |
| 227. 25                          | Bethel station, Maine.....                  | 643                                     | 654                              |
| 232. 00                          | Loche station, Maine .....                  | 715                                     | 726                              |
| 241. 62                          | West Paris station, Maine .....             | 475                                     | 486                              |
| 250. 00                          | South Paris station, Maine .....            | 381                                     | 392                              |
| 256. 50                          | Oxford station, Maine .....                 | 322                                     | 333                              |
| 261. 00                          | Mechanic Falls station, Maine.....          | 289                                     | 300                              |
| 267. 50                          | Lewiston junction, Maine .....              | 237                                     | 248                              |
| 269. 75                          | Danville junction, Maine.....               | 192                                     | 203                              |
| 269. 88                          | Maine Central railway (crossing) Maine..... | 189                                     | 200                              |
| 274. 62                          | New Gloucester station, Maine.....          | 107                                     | 118                              |
| 282. 00                          | North Yarmouth station, Maine.....          | 91                                      | 102                              |
| 286. 00                          | Yarmouth station, Maine .....               | 85                                      | 96                               |
| 288. 38                          | Cumberland station, Maine.....              | 74                                      | 85                               |
| 291. 75                          | Falmouth station, Maine .....               | 40                                      | 51                               |
| 296. 00                          | Portland and Rochester junction, Maine..... | 2                                       | 13                               |
| 297. 75                          | Portland station, Maine .....               | 3                                       | 14                               |
| LEWISTON BRANCH.                 |                                             |                                         |                                  |
| 267. 50                          | Lewiston junction (main line) Maine.....    | 237                                     | 248                              |
| 271. 50                          | Taylor Brook, Maine .....                   | 194                                     | 205                              |
| 272. 63                          | Auburn station, Maine.....                  | 137                                     | 148                              |
| 273. 00                          | Lewiston station, Maine.....                | 129                                     | 140                              |

## GRAND TRUNK RAILWAY—QUEBEC AND RICHMOND DIVISION.

|         |                                            |     |     |
|---------|--------------------------------------------|-----|-----|
| 0. 00   | Montreal .....                             |     |     |
| 76. 50  | Richmond station .....                     | 380 | 391 |
| 88. 38  | St. Cyr siding .....                       | 471 | 482 |
| 92. 50  | Kingsey station .....                      | 433 | 444 |
| 100. 50 | Warwick station .....                      | 470 | 481 |
| 108. 50 | Arthabaska station.....                    | 419 | 430 |
| 117. 25 | Stanford station .....                     | 117 | 128 |
| 123. 25 | Somerset station .....                     | 431 | 442 |
| 131. 38 | St. Julie Station .....                    | 464 | 475 |
| 136. 00 | Lyster station .....                       | 435 | 446 |
| 143. 88 | Methot's Mills station.....                | 433 | 444 |
| 152. 12 | St. Agassit station .....                  | 395 | 406 |
| 157. 75 | Craig's Road station .....                 | 324 | 335 |
| 164. 88 | Chandière Curve station.....               | 218 | 229 |
| 172. 00 | Point Levi (opposite Quebec) station ..... | 3   | 14  |

Through the permission of Mr. Hanneford, the chief engineer of the Grand Trunk railway, Mr. James Wilson procured for me the levels of the Grand Trunk railway along its various divisions. As the original profiles were burned, the road has subsequently been relevelled, and the elevations of all the towns refer to track opposite the various stations. The horizontal measurements on the modern profiles do not always agree with those on time-tables, which were taken from the original profiles, and underwent subsequent changes.

## TORONTO AND NIPISSING RAILWAY.

| Distance.<br>from<br>Toronto. | Localities.                              | Elevation<br>above Lake<br>Ontario. | Elevation<br>above mean<br>tide. |
|-------------------------------|------------------------------------------|-------------------------------------|----------------------------------|
| <i>Miles.</i>                 |                                          | <i>Feet.</i>                        | <i>Feet.</i>                     |
| 0.00                          | Toronto station .....                    | 8                                   | 255                              |
| 9.00                          | Scarboro junction .....                  | 300                                 | 547                              |
| 14.00                         | Agincourt station .....                  | 322                                 | 569                              |
| 17.00                         | Millikens station .....                  | 404                                 | 651                              |
| 20.00                         | Unionville station .....                 | 330                                 | 577                              |
| 22.50                         | Markham station .....                    | 393                                 | 640                              |
| 29.00                         | Stouffville station .....                | 645                                 | 892                              |
| 34.00                         | Goodwood station .....                   | 843                                 | 1,090                            |
| 36.00                         | Summit station .....                     | 893                                 | 1,140                            |
| 41.00                         | Uxbridge station .....                   | 630                                 | 877                              |
| 49.00                         | Wicks station .....                      | 609                                 | 856                              |
| 53.00                         | Sunderland station .....                 | 604                                 | 851                              |
| 59.00                         | Cannington station .....                 | 599                                 | 846                              |
| 63.00                         | Woodville station .....                  | 649                                 | 896                              |
| 64.75                         | Midland railway junction .....           | 634                                 | 881                              |
| 66.00                         | Argyle junction .....                    | 613                                 | 860                              |
| 71.00                         | Eldon junction .....                     | 623                                 | 870                              |
| 74.50                         | Portage road .....                       | 664                                 | 911                              |
| 76.00                         | Kirkfield station .....                  | 645                                 | 892                              |
| 79.00                         | Victoria road .....                      | 590                                 | 837                              |
| 87.00                         | Coboconk station .....                   | 600                                 | 847                              |
| .....                         | .....do .....outlet of Balsam lake ..... | (†) 588                             | 835                              |

These elevations refer to track opposite stations. They were furnished through the kindness of W. Goodenham, jr., Esq., president and managing director of the road. The road has subsequently passed under the management of the Midland railway.

## MIDLAND RAILWAY.

| Distance.<br>from<br>Port Hope. | Localities.                       | Elevation<br>above Lake<br>Ontario. | Elevation<br>above mean<br>tide. |
|---------------------------------|-----------------------------------|-------------------------------------|----------------------------------|
| <i>Miles.</i>                   |                                   | <i>Feet.</i>                        | <i>Feet.</i>                     |
| 0.00                            | Lake Ontario at Port Hope .....   | 00                                  | 247                              |
| 1.50                            | Sand ridge .....                  | 95                                  | 342                              |
| 3.00                            | Clay ridge .....                  | 140                                 | 387                              |
| 5.00                            | Quay's station .....              | 234                                 | 481                              |
| 8.00                            | Perrytown station .....           | 405                                 | 652                              |
| 12.00                           | Clay ridge .....                  | 558                                 | 805                              |
| 13.25                           | Ridge .....                       | 665                                 | 912                              |
| 14.00                           | Summit station .....              | 663                                 | 910                              |
| 17.50                           | Millbrook station .....           | 525                                 | 772                              |
| 20.33                           | Ridge .....                       | 650                                 | 897                              |
| 22.75                           | Caran's Creek (bed) .....         | 525                                 | 772                              |
| 24.00                           | Ridge .....                       | 675                                 | 922                              |
| 26.00                           | Valley .....                      | 387                                 | 634                              |
| 29.00                           | Ridge .....                       | 665                                 | 912                              |
| 32.25                           | Pigeon creek (bed) .....          | 558                                 | 805                              |
| 33.75                           | Ridge .....                       | 663                                 | 910                              |
| 41.00                           | Lindsay station .....             | 618                                 | 865                              |
| 41.25                           | Scugog river (below dam) .....    | 561                                 | 808                              |
| 42.50                           | ...do ... river (above dam) ..... | 568                                 | 815                              |
| 44.00                           | Victoria junction .....           | 606                                 | 853                              |
| 48.00                           | Cambray's ridge .....             | 679                                 | 926                              |

*Midland Railway—Continued.*

| Distance<br>from Port<br>Hope. | Localities.                                                | Elevation<br>above Lake<br>Ontario. | Elevation<br>above mean<br>tide. |
|--------------------------------|------------------------------------------------------------|-------------------------------------|----------------------------------|
| <i>Miles.</i>                  |                                                            | <i>Feet.</i>                        | <i>Feet.</i>                     |
| 57.00                          | Woodville junction .....                                   | 650                                 | 697                              |
| 65.00                          | Beaverton station .....                                    | 516                                 | 763                              |
| 67.00                          | Lancaster, surface of Simcoe lake .....                    | (†) 477                             | 724                              |
| 67.50                          | Talbot river (bed) .....                                   | 465                                 | 712                              |
| 69.00                          | Gamebridge station .....                                   | 550                                 | 797                              |
| 73.00                          | Brechin station .....                                      | 510                                 | 757                              |
| 73.50                          | Ridge of rocks .....                                       | 519                                 | 766                              |
| 75.00                          | } Mara swamps .....                                        | 483                                 | 730                              |
| 78.00                          |                                                            |                                     |                                  |
| 83.00                          | Bed of narrows between Simcoe and Conchou-<br>ching lakes. | 457                                 | 704                              |
| 90.00                          | North river bed .....                                      | 389                                 | 636                              |
| 101.00                         | Coldwater river bed .....                                  | 341                                 | 588                              |
| 108.00                         | Sturgeon river bed .....                                   | 331                                 | 578                              |
| 118.00                         | Midland, Georgian bay (average water-level)                | 332                                 | 579                              |

## LAKEFIELD BRANCH.

|       |                            |     |     |
|-------|----------------------------|-----|-----|
| 17.00 | Millbrook junction .....   | 525 | 772 |
| 24.25 | Moffat's creek .....       | 370 | 617 |
| 30.50 | Peterborough station ..... | 403 | 650 |

## MIDLAND RAILWAY—WHITBY DIVISION.

| Distance<br>from<br>Whitby. | Localities.                                   | Elevation<br>above Lake<br>Ontario. | Elevation<br>above mean<br>tide. |
|-----------------------------|-----------------------------------------------|-------------------------------------|----------------------------------|
| <i>Miles.</i>               |                                               | <i>Feet.</i>                        | <i>Feet.</i>                     |
| 0.00                        | Lake Ontario at Whitby .....                  | 00                                  | 247                              |
| 0.75                        | G. T. R. junction .....                       | 21                                  | 268                              |
| 2.00                        | Whitby station .....                          | 41                                  | 288                              |
| 6.00                        | Gravel ridge .....                            | 251                                 | 498                              |
| 7.50                        | Brooklin station .....                        | 292                                 | 539                              |
| 12.00                       | Clay ridge .....                              | 649                                 | 896                              |
| 14.00                       | ....do.....                                   | 781                                 | 1,028                            |
| 19.00                       | Port Perry station .....                      | 592                                 | 839                              |
|                             | ....do.... Lake Scugog .....                  | (†) 596                             | 843                              |
| 24.00                       | Clay ridge .....                              | 628                                 | 875                              |
| 29.00                       | ....do.....                                   | 680                                 | 927                              |
| 31.50                       | Manilla station .....                         | 708                                 | 955                              |
| 33.50                       | Clay ridge .....                              | 674                                 | 921                              |
| 42.00                       | ....do.... opposite to Mariposa station ..... | 637                                 | 884                              |
| 43.50                       | ....do.....                                   | 673                                 | 920                              |
| 45.25                       | Lindsay station .....                         | 604                                 | 851                              |

## GRAND JUNCTION DIVISION OF MIDLAND RAILWAY.

| Distance from Belleville. | Localities.                               | Elevation above Lake Ontario. | Elevation above mean tide. |
|---------------------------|-------------------------------------------|-------------------------------|----------------------------|
| <i>Miles.</i>             |                                           | <i>Feet.</i>                  | <i>Feet.</i>               |
| 0.00                      | Lake Ontario at Belleville .....          | 00                            | 247                        |
| 15.00                     | Junction of N. Hastings branch .....      | 269                           | 516                        |
| 19.25                     | Rawdon creek bed .....                    | 157                           | 404                        |
| 20.00                     | Stirling station .....                    | 168                           | 415                        |
| 26.00                     | Bed of creek .....                        | 128                           | 375                        |
| 32.00                     | do. ....                                  | 293                           | 540                        |
| 33.10                     | Trent river bed (limestone) .....         | 232                           | 479                        |
| 33.50                     | Campbellford station .....                | 260                           | 507                        |
| 44.00                     | Hasting station .....                     | 388                           | 635                        |
| 44.75                     | Trent river bed above Hastings' dam ..... | 365                           | 612                        |
| 49.25                     | Onse river bed .....                      | 373                           | 620                        |
| 53.75                     | do. ....                                  | 455                           | 702                        |
| 56.75                     | Indian river bed (limestone) .....        | 390                           | 637                        |
| 61.25                     | Ridge .....                               | 495                           | 742                        |
| 65.00                     | Otonabee river bed .....                  | 369                           | 616                        |
|                           | Otonabee river (surface of water) .....   | 385                           | 632                        |
| 66.00                     | Peterborough station .....                | 403                           | 660                        |

## NORTH HASTINGS BRANCH OF GRAND JUNCTION DIVISION.

|       |                                  |        |        |
|-------|----------------------------------|--------|--------|
| 0.00  | Lake Ontario at Belleville ..... | -----  | 247.00 |
| 5.00  | Hayden's Corners .....           | 102.00 | 349.00 |
| 9.00  | Moirs river bed .....            | 88.00  | 335.00 |
| 15.00 | North Hastings junction .....    | 269.00 | 516.00 |
| 20.00 | Rawdon creek .....               | 230.00 | 477.00 |
| 23.00 | do. ....                         | 313.00 | 560.00 |
| 24.00 | White lake (surface) .....       | 327.00 | 574.00 |
| 26.50 | Granite ridge .....              | 333.00 | 580.00 |
| 27.50 | Moirs lake (surface) .....       | 272.00 | 519.00 |
| 29.75 | Madoc station .....              | 337.00 | 584.00 |
| 33.50 | Seymour's mine (surface) .....   | 508.00 | 755.00 |
| 34.50 | Stoney ridge (surface) .....     | 574.00 | 821.00 |
| 37.00 | Moore's mine (surface) .....     | 538.00 | 785.00 |
| 39.00 | Eldorado (terminus) .....        | 510.00 | 757.00 |

T. A. Hay, Esq., acting engineer of the Midland railway and Grand Junction railway, kindly furnished all the above elevations of the Midland railway and its branches.

## ONTARIO AND QUEBEC RAILWAY.

| Distances from Carlton. | Localities.                                                                             | Elevation above Lake Ontario. | Elevation above mean tide. |
|-------------------------|-----------------------------------------------------------------------------------------|-------------------------------|----------------------------|
| <i>Miles.</i>           |                                                                                         | <i>Feet.</i>                  | <i>Feet.</i>               |
| 0.00                    | Carlton station, junction with Credit Valley railway (about 5 miles from Toronto) ..... | 147.00                        | 394.00                     |
| 3.82                    | Yorkville station .....                                                                 | 159.00                        | 406.00                     |
| 7.20                    | River Don :                                                                             |                               |                            |
|                         | Banks .....                                                                             | 174.00                        | 421.00                     |
|                         | Bed .....                                                                               | 64.00                         | 311.00                     |

*Ontario and Quebec Railway—Continued.*

| Distance<br>from<br>Carlton. | Localities.                               | Elevation<br>above Lake<br>Ontario. | Elevation<br>above mean<br>tide. |
|------------------------------|-------------------------------------------|-------------------------------------|----------------------------------|
| <i>Miles.</i>                |                                           | <i>Feet.</i>                        | <i>Feet.</i>                     |
| 8.82                         | Little Don river bank .....               | 204.00                              | 451.00                           |
|                              | .....do .....                             | 91.00                               | 338.00                           |
| 13.31                        | Agincourt station .....                   | 324.00                              | 571.00                           |
| 18.14                        | River Rouge bed .....                     | 239.00                              | 456.00                           |
| 23.78                        | Duffin's creek station .....              | 399.00                              | 646.00                           |
| 29.22                        | Claremont station .....                   | 638.00                              | 885.00                           |
| 34.12                        | Myrtle station .....                      | 640.00                              | 887.00                           |
| 54.32                        | Summit .....                              | 853.00                              | 1,100.00                         |
| 56.21                        | Pontypool station .....                   | 817.00                              | 1,064.00                         |
| 68.30                        | Casan station .....                       | 401.00                              | 648.00                           |
| 77.35                        | Peterborough, bed of Otonabee river ..... | 376.00                              | 623.00                           |
|                              | Water-level of river .....                | 357.00                              | 634.00                           |
| 88.50                        | Indian river .....                        | 414.00                              | 661.00                           |
| 113.65                       | Crow river .....                          | 344.00                              | 591.00                           |
| 131.60                       | Gravel ridge .....                        | 360.00                              | 607.00                           |
| 132.80                       | Tweed village .....                       | 324.00                              | 571.00                           |
| 135.40                       | Moirs river bed (limestone) .....         | 208.00                              | 455.00                           |
| 135.90                       | Granite ridge .....                       | 252.00                              | 499.00                           |
| 136.80                       | Stoco lake .....                          | 210.00                              | 457.00                           |
|                              | Crossing Salmon river .....               | 363.00                              | 610.00                           |
|                              | Clear lake .....                          | 363.00                              | 610.00                           |
| 156.55                       | Sharbot lake .....                        | 389.00                              | 636.00                           |
| 178.60                       | Summit .....                              | 505.00                              | 752.00                           |
|                              | Fall river crossing .....                 | 323.00                              | 575.00                           |
|                              | McGowan's lake .....                      | 324.00                              | 571.00                           |
| 180.43                       | Perth station .....                       | 184.00                              | 431.00                           |

As the road was not completed in the summer of 1883, the stations east of Peterborough were not located, but the country does not differ greatly in altitudes from those of the few above-mentioned lakes, &c.

These elevations were obtained from C. E. W. Dodwell, Esq., engineer of the Ontario and Quebec railroad.

## SAINT LAWRENCE AND OTTAWA RAILROAD.

| Distance<br>from<br>Prescott. | Localities.                            | Elevation<br>above Lake<br>St. Peter. | Elevation<br>above mean<br>tide. |
|-------------------------------|----------------------------------------|---------------------------------------|----------------------------------|
| <i>Miles.</i>                 |                                        | <i>Feet.</i>                          | <i>Feet.</i>                     |
| 0.00                          | Saint Lawrence river at Prescott ..... | 228.00                                | 239.00                           |
| 3.41                          | Corner's ridge .....                   | *309.00                               | 320.00                           |
| 7.86                          | Nation river bed .....                 | 267.00                                | 278.00                           |
| 16.25                         | .....do .....                          | 344.00                                | 355.00                           |
| 22.25                         | Kemptville .....                       | 280.00                                | 291.00                           |
| 27.18                         | Rideau creek .....                     | 262.00                                | 273.00                           |
| 40.15                         | Spratt's ridge .....                   | 340.00                                | 351.00                           |
| 52.78                         | Bed of Rideau river .....              | 100.00                                | 111.00                           |
| 53.20                         | Ottawa station .....                   | 122.00                                | 133.00                           |

These elevations were taken from the profiles furnished by the chief engineer, J. S. Macklin, Esq.

The record of elevation of datum was defective, and the above reductions appear to be about 27 feet too low.

## SAINT LAWRENCE RIVER.

| Distance from Montreal. | Localities.                                                                       | Elevation above Lake Saint Peter. | Elevation above mean tide. |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------|----------------------------|
| <i>Miles.</i>           |                                                                                   | <i>Feet.</i>                      | <i>Feet.</i>               |
| 0.00                    | Flats of Lake Saint Peter, Saint Lawrence river, to which high tide reaches ..... | 11.00                             | 23.00                      |
| 8.50                    | Montreal, foot of No. 1 Lock, Lachine Canal.                                      | 55.75                             | 66.75                      |
|                         | Lake Saint Louis .....                                                            |                                   |                            |
|                         | Beauharnois Canal:                                                                |                                   |                            |
| 23.75                   | Foot of .....                                                                     | 55.75                             | 66.75                      |
| 35.00                   | Head of .....                                                                     | 140.00                            | 151.00                     |
|                         | Cornwall Canal:                                                                   |                                   |                            |
| 67.75                   | Foot of .....                                                                     | 140.00                            | 151.00                     |
| 79.25                   | Head of .....                                                                     | 189.25                            | 200.25                     |
|                         | Farran's Point Canal:                                                             |                                   |                            |
| 84.25                   | Foot of .....                                                                     | 189.25                            | 200.25                     |
| 85.00                   | Head of .....                                                                     | 193.25                            | 204.25                     |
|                         | Rapide Flat Canal:                                                                |                                   |                            |
| 95.50                   | Foot of .....                                                                     | 197.00                            | 208.00                     |
| 99.50                   | Head of .....                                                                     | 212.25                            | 223.25                     |
|                         | Galops Rapids Canal:                                                              |                                   |                            |
| 101.00                  | Foot of .....                                                                     | 212.25                            | 223.25                     |
| 111.62                  | Head of .....                                                                     | 228.00                            | 239.00                     |
| 178.00                  | Saint Lawrence, navigation at Kingston .....                                      | 234.00                            | 245.00                     |

## OTTAWA RIVER AND RIDEAU NAVIGATION.

|        |                                                                             |        |        |
|--------|-----------------------------------------------------------------------------|--------|--------|
| 0.00   | Foot of No. 1 Lock, Montreal .....                                          | 12.00  | 23.00  |
| 8.50   | Junction of Ottawa and Saint Lawrence rivers at head of Lachine canal ..... | 55.75  | 66.75  |
| 120.00 | Entrance to Rideau canal at Ottawa city ....                                | 118.00 | 129.00 |

Rideau canal and other water-courses between Ottawa city, on Ottawa river, and the Saint Lawrence river, at Kingston, form a navigation of 126.25 miles in length, with the summit of navigation 400 feet above lake Saint Peter, or 411 feet above mean tide.

The river elevations are taken from the Reports upon Public Works by the Chief Engineer of Canals.

## QUEBEC, MONTREAL, OTTAWA AND OCCIDENTAL RAILWAY

| Distance from Montreal. | Localities.                                          | Elevation above Lake Ontario. | Elevation above mean tide. |
|-------------------------|------------------------------------------------------|-------------------------------|----------------------------|
| <i>Miles.</i>           |                                                      | <i>Feet.</i>                  | <i>Feet.</i>               |
|                         | MONTREAL TO OTTAWA.                                  |                               |                            |
| 0.00                    | Montreal, Hochelaga street and Montreal avenue ..... |                               | 70                         |
| 2.92                    | Mile-end station .....                               |                               | 225                        |
| 5.22                    | Rivière des Prairies:                                |                               |                            |
|                         | South bank .....                                     |                               | 82                         |
|                         | Surface of water .....                               |                               | 00                         |
|                         | Rocky bed .....                                      |                               | 32                         |
| 8.65                    | North bank .....                                     |                               | 87                         |
| 14.20                   | .....                                                |                               | 150                        |



*Quebec, Montreal, Ottawa and Occidental Railway—Continued.*

| Distance<br>from<br>Montreal. | Localities.                             | Elevation<br>above lake<br>Ontario. | Elevation<br>above mean<br>tide. |
|-------------------------------|-----------------------------------------|-------------------------------------|----------------------------------|
| <i>Miles.</i>                 | MONTREAL TO OTTAWA—Continued.           | <i>Feet.</i>                        | <i>Feet.</i>                     |
| 15. 51                        | Saint Rose station .....                |                                     | 85                               |
| 15. 81                        | Mille Isles (bed of river) .....        |                                     | 43                               |
| 18. 60                        | Saint Jerome junction .....             |                                     | 135                              |
| 25. 80                        | Saint Janvier station .....             |                                     | 220                              |
| 41. 85                        | Saint Jerome station .....              |                                     | 311                              |
| 25. 90                        | Dobbies station .....                   |                                     | 227                              |
| 30. 72                        | Saint Scholastique station .....        |                                     | 238                              |
| .....                         | do ..... Bell river bed .....           |                                     | 214                              |
| 35. 87                        | Saint Hermas station .....              |                                     | 257                              |
| 42. 55                        | Lachute station .....                   |                                     | 225                              |
| 47. 00                        | Muddy branch station .....              |                                     | 262                              |
| 50. 00                        | .....                                   |                                     | 340                              |
| 55. 50                        | Grenville station .....                 |                                     | 210                              |
| 58. 51                        | Calumet river .....                     |                                     | 147                              |
| 63. 30                        | Pointe au Chêne station .....           |                                     | 188                              |
| 72. 83                        | Montebello station .....                |                                     | 172                              |
| 75. 60                        | Papineauville station .....             |                                     | 155                              |
| 82. 97                        | Nation river bed .....                  |                                     | 125                              |
| 83. 17                        | .....                                   |                                     | 185                              |
| 88. 74                        | Thurso station .....                    |                                     | 186                              |
| 91. 00                        | Blanche river bed .....                 |                                     | 128                              |
| 98. 20                        | Buckingham station .....                |                                     | 183                              |
| .....                         | do ..... Rivière aux Lievres, bed ..... |                                     | 150                              |
| 108. 80                       | East Templeton station .....            |                                     | 155                              |
| 112. 50                       | Gatineau Point station .....            |                                     | 175                              |
| 116. 78                       | Hull station .....                      |                                     | 185                              |
| 124. 24                       | Aylmer station .....                    |                                     | 222                              |

The levels of this section of the Quebec, Montreal, Ottawa and Occidental Railway were furnished from the construction profiles (referred to harbor datum), from which they were reduced to mean ocean level.

**ALPHABETIC LIST OF ELEVATIONS IN CANADA, AB-  
STRACTED FROM THE FOREGOING PROFILES.**

| Station.                           | Authority.                 | Elevation<br>above mean<br>ocean level. |
|------------------------------------|----------------------------|-----------------------------------------|
|                                    |                            | <i>Feet.</i>                            |
| Acton, Ontario .....               | Grand Trunk R. R. ....     | 1, 159                                  |
| Quebec .....                       | Grand Trunk R. R. ....     | 312                                     |
| Agincourt .....                    | T. & N. R. R. ....         | 569                                     |
| Ailsa Craig .....                  | Grand Trunk R. R. ....     | 754                                     |
| Allanburg .....                    | Welland R. R. ....         | 592                                     |
| Allandale .....                    | H. & N. W. R. R. ....      | 755                                     |
| do .....                           | Northern R. R. ....        | 738                                     |
| Attarcliffe .....                  | Canada Southern R. R. .... | 591                                     |
| Alton .....                        | T., G. & B. R. R. ....     | 1, 298                                  |
| Amaranth .....                     | T., G. & B. R. R. ....     | 1, 546                                  |
| Angus (Pine River) .....           | Northern R. R. ....        | 627                                     |
| Appin .....                        | Great Western R. R. ....   | 743                                     |
| Argyle .....                       | T. & N. R. R. ....         | 860                                     |
| Arthabaska .....                   | Grand Trunk R. R. ....     | 430                                     |
| Arthur .....                       | T., G. & B. R. R. ....     | 1, 525                                  |
| Aylmer .....                       | Q., M., O. & O. R. R. .... | 222                                     |
| Ayr .....                          | Credit Valley R. R. ....   | 965                                     |
| Buden .....                        | Grand Trunk R. R. ....     | 1, 157                                  |
| Ballantyne's .....                 | Grand Trunk R. R. ....     | 361                                     |
| Baptist Creek .....                | Great Western R. R. ....   | 595                                     |
| Barrie .....                       | Northern R. R. ....        | 726                                     |
| Do .....                           | H. & N. W. R. R. ....      | 872                                     |
| Do Lake Simcoe .....               | Northern R. R. ....        | 722                                     |
| Beaverton .....                    | Midland R. R. ....         | 763                                     |
| Beeton junction .....              | H. & N. W. R. R. ....      | 716                                     |
| Beechville .....                   | Great Western R. R. ....   | 907                                     |
| Belgrave .....                     | Great Western R. R. ....   | 1, 062                                  |
| Belleville .....                   | Grand Trunk R. R. ....     | 286                                     |
| Belœil .....                       | Grand Trunk R. R. ....     | 63                                      |
| Do Richelieu river (surface) ..... | Grand Trunk R. R. ....     | 48                                      |
| Beausville .....                   | Great Western R. R. ....   | 294                                     |
| Berkeley .....                     | T., G. & B. R. R. ....     | 1, 329                                  |
| Berlin .....                       | Grand Trunk R. R. ....     | 1, 101                                  |
| Do junction .....                  | Grand Trunk R. R. ....     | 1, 096                                  |
| Bertie .....                       | Grand Trunk R. R. ....     | 618                                     |
| Bismarck .....                     | Canada Southern R. R. .... | 711                                     |
| Blackwell .....                    | Grand Trunk R. R. ....     | 602                                     |
| Blandford .....                    | Credit Valley R. R. ....   | 972                                     |
| Bluevale .....                     | W., G. & B. R. R. ....     | 1, 079                                  |
| Blyth .....                        | Great Western R. R. ....   | 1, 081                                  |
| Bolton .....                       | T., G. & B. ....           | 838                                     |
| Bothwell .....                     | Great Western R. R. ....   | 691                                     |
| Bowmanville .....                  | Grand Trunk R. R. ....     | 263                                     |
| Bradford .....                     | Northern R. R. ....        | 725                                     |
| Bramly .....                       | Northern R. R. ....        | 888                                     |
| Brampton .....                     | Credit Valley R. R. ....   | 724                                     |
| Do .....                           | Grand Trunk R. R. ....     | 713                                     |
| Branchton .....                    | W., G. & B. R. R. ....     | 897                                     |
| Brantford .....                    | Grand Trunk R. R. ....     | 706                                     |
| Do bridge over Grand river .....   | Great Western R. R. ....   | 659                                     |
| Do bed of Grand river .....        |                            | 645                                     |

| Station.                              | Authority.                 | Elevation<br>above mean<br>ocean level. |
|---------------------------------------|----------------------------|-----------------------------------------|
|                                       |                            | <i>Feet.</i>                            |
| Brechin .....                         | T. & N. R. R. ....         | 757                                     |
| Brecon .....                          | Great Western R. R. ....   | 900                                     |
| Brentwood .....                       | Northern R. R. ....        | 647                                     |
| Brealau .....                         | Grand Trunk R. R. ....     | 1,025                                   |
| Brigden .....                         | Canada Southern R. R. .... | 636                                     |
| Bright .....                          | Grand Trunk R. R. ....     | 1,041                                   |
| Brighton .....                        | Grand Trunk R. R. ....     | 304                                     |
| Britannia Mills .....                 | Grand Trunk R. R. ....     | 222                                     |
| Brockville .....                      | Grand Trunk R. R. ....     | 281                                     |
| Brompton Falls .....                  | Grand Trunk R. R. ....     | 471                                     |
| Bronté .....                          | Great Western R. R. ....   | 346                                     |
| Brookfield .....                      | Canada Southern R. R. .... | 610                                     |
| Brooklin .....                        | Midland R. R. ....         | 537                                     |
| Brucefield .....                      | Great Western R. R. ....   | 890                                     |
| Brussels .....                        | W., G. & B. R. R. ....     | 1,122                                   |
| Buckingham .....                      | Q., M., O. & O. R. R. .... | 183                                     |
| Burford .....                         | Great Western R. R. ....   | 844                                     |
| Burlington .....                      | Great Western R. R. ....   | 340                                     |
| Do .....                              | H. & N. W. R. R. ....      | 253                                     |
| Do... Beach (Ocean House) .....       | H. & N. W. R. R. ....      | 255                                     |
| Do... (G. W. R. R. crossing) .....    | H. & N. W. R. R. ....      | 318                                     |
| Buxton .....                          | Canada Southern R. R. .... | 602                                     |
| Carlton .....                         | Grand Trunk R. R. ....     | 406                                     |
| Do (sand and gravel bed) .....        | T. G. & B. R. R. ....      | 407                                     |
| Caledon (sand bed near) .....         | H. & N. W. R. R. ....      | 942                                     |
| Camalachie .....                      | Grand Trunk R. R. ....     | 649                                     |
| Campbellford .....                    | Midland R. R. ....         | 507                                     |
| Campbellville .....                   | Credit Valley R. R. ....   | 929                                     |
| Canaan .....                          | O. & Q. R. R. ....         | 648                                     |
| Canfield (G. T. R. R. crossing) ..... | Canada Southern R. R. .... | 621                                     |
| Do... junction crossing .....         | Grand Trunk R. R. ....     | 616                                     |
| Cannington .....                      | T. & N. R. R. ....         | 846                                     |
| Centralia .....                       | Great Western R. R. ....   | 867                                     |
| Chandière Curve .....                 | Grand Trunk R. R. ....     | 229                                     |
| Charing Cross .....                   | Canada Southern R. R. .... | 628                                     |
| Charleston (gravel bed near) .....    | T. G. & B. R. R. ....      | 1,367                                   |
| Chatham .....                         | Great Western R. R. ....   | 598                                     |
| Chatsworth (gravel beds) .....        | T. G. & B. R. R. ....      | 944                                     |
| Clandeboyne .....                     | Great Western R. R. ....   | 868                                     |
| Claremont .....                       | O. & Q. R. R. ....         | 885                                     |
| Clear lake .....                      | O. & Q. R. R. ....         | 610                                     |
| Clifford .....                        | W., G. & B. R. R. ....     | 1,234                                   |
| Clinton .....                         | Great Western R. R. ....   | 919                                     |
| Do .....                              | Grand Trunk R. R. ....     | 921                                     |
| Coaticoke .....                       | Grand Trunk R. R. ....     | 1,007                                   |
| Coboconk .....                        | T. & N. R. R. ....         | 847                                     |
| Cobourg .....                         | Grand Trunk R. R. ....     | 297                                     |
| Colborne .....                        | Grand Trunk R. R. ....     | 322                                     |
| Colchester .....                      | Canada Southern R. R. .... | 611                                     |
| Collingwood .....                     | H. & N. W. R. R. ....      | 589                                     |
| Do .....                              | Northern R. R. ....        | 590                                     |
| Colwell junction .....                | Northern R. R. ....        | 750                                     |
| Comber .....                          | Canada Southern R. R. .... | 604                                     |
| Compton .....                         | Grand Trunk R. R. ....     | 734                                     |
| Cook's Station .....                  | Grand Trunk R. R. ....     | 643                                     |
| Cooksville (gravel) .....             | Credit Valley R. R. ....   | 393                                     |
| Copetown .....                        | Great Western R. R. ....   | 749                                     |
| Corinth .....                         | Great Western R. R. ....   | 769                                     |
| Cornell .....                         | Canada Southern R. R. .... | 797                                     |
| Cornwall .....                        | Grand Trunk R. R. ....     | 192                                     |

| Station.                                    | Authority.                 | Elevation<br>above mean<br>ocean level. |
|---------------------------------------------|----------------------------|-----------------------------------------|
|                                             |                            | <i>Feet.</i>                            |
| Coteau Landing .....                        | Grand Trunk R. R. ....     | 161                                     |
| Courtright (Saint Clair river at) .....     | Canada Southern R. R. .... | 584                                     |
| Craigleith .....                            | Northern R. R. ....        | 590                                     |
| Craigvale .....                             | Northern R. R. ....        | 879                                     |
| Danby .....                                 | Grand Trunk R. R. ....     | 438                                     |
| Dean's .....                                | Canada Southern R. R. .... | 686                                     |
| Dixville .....                              | Grand Trunk R. R. ....     | 1,127                                   |
| Dobbin's .....                              | Q., M., O. & O. R. R. .... | 227                                     |
| Dorchester .....                            | Great Western R. R. ....   | 852                                     |
| Drayton .....                               | W., G. & B. R. R. ....     | 1,394                                   |
| Drumbo .....                                | Credit Valley R. R. ....   | 1,013                                   |
| Dublin .....                                | Grand Trunk R. R. ....     | 1,104                                   |
| Duffin's Creek .....                        | Grand Trunk R. R. ....     | 287                                     |
| Dundalk .....                               | T., G. & B. R. R. ....     | 1,701                                   |
| Dundas .....                                | Great Western R. R. ....   | 517                                     |
| Do...marsh (track over old outlet of) ..... | Great Western R. R. ....   | 329                                     |
| Dunroon .....                               | H. & N. W. R. R. ....      | 936                                     |
| Dunville .....                              | Grand Trunk R. R. ....     | 585                                     |
| East Templeton .....                        | Q., M., O. & O. R. R. .... | 155                                     |
| Eastwood .....                              | Great Western R. R. ....   | 973                                     |
| Edwardsburg (Cardinal) .....                | Grand Trunk R. R. ....     | 277                                     |
| Eldon junction .....                        | T. & N. R. R. ....         | 870                                     |
| Eldorado .....                              | Midland R. R. ....         | 757                                     |
| Elora .....                                 | W., G. & B. R. R. ....     | 1,297                                   |
| Do...junction (Church Falls) .....          | Credit Valley R. R. ....   | 1,260                                   |
| Ekfred .....                                | Canada Southern R. R. .... | 750                                     |
| Erie .....                                  | Canada Southern R. R. .... | 597                                     |
| Erie and Niagara railway junction .....     | Canada Southern R. R. .... | 608                                     |
| Erin .....                                  | Credit Valley R. R. ....   | 1,295                                   |
| Essex Center .....                          | Canada Southern R. R. .... | 646                                     |
| Ethel .....                                 | W., G. & B. R. R. ....     | 1,174                                   |
| Everett .....                               | H. & N. W. R. R. ....      | 796                                     |
| Exeter .....                                | Great Western R. R. ....   | 875                                     |
| Farran's Point .....                        | Grand Trunk R. R. ....     | 242                                     |
| Flesherton (sand and gravel bed) .....      | T., G. & B. R. R. ....     | 1,557                                   |
| Fletcher .....                              | Canada Southern R. R. .... | 599                                     |
| Fordwick .....                              | T., G. & B. R. R. ....     | 1,200                                   |
| Forrest .....                               | Grand Trunk R. R. ....     | 712                                     |
| Fort Erie .....                             | Grand Trunk R. R. ....     | 606                                     |
| Fergus .....                                | W. G. & B. R. R. ....      | 1,358                                   |
| Fergus junction .....                       | Credit Valley R. R. ....   | 1,357                                   |
| Galt .....                                  | W., G. & B. R. R. ....     | 888                                     |
| Do .....                                    | Credit Valley R. R. ....   | 936                                     |
| Do .....                                    | Grand Trunk R. R. ....     | 880                                     |
| Gamebridge .....                            | T. & N. R. R. ....         | 797                                     |
| Ganonoque .....                             | Grand Trunk R. R. ....     | 261                                     |
| Garafraxa junction .....                    | Credit Valley R. R. ....   | 1,452                                   |
| Gatineau Point .....                        | Q., M., O. & O. R. R. .... | 175                                     |
| Georgetown .....                            | Grand Trunk R. R. ....     | 847                                     |
| Do...junc. (H. & N. W. R. R.) .....         | Grand Trunk R. R. ....     | 874                                     |
| Do... (gravel bed) .....                    | H. & N. W. R. R. ....      | 891                                     |
| Gilford .....                               | Northern R. R. ....        | 753                                     |
| Glencairn .....                             | H. & N. W. R. R. ....      | 738                                     |
| Glencoe .....                               | Great Western R. R. ....   | 730                                     |
| Do...junction .....                         | Great Western R. R. ....   | 728                                     |
| Glen Williams .....                         | H. & N. W. R. R. ....      | 910                                     |
| Gorrie & Wroxeter .....                     | T., G. & B. R. R. ....     | 1,123                                   |
| Goderich .....                              | Grand Trunk R. R. ....     | 730                                     |
| Goldstone .....                             | W., G. & B. R. R. ....     | 1,257                                   |
| Goodward .....                              | T. & N. R. R. ....         | 1,090                                   |

| Station.                                           | Authority.                          | Elevation<br>above mean<br>ocean level. |
|----------------------------------------------------|-------------------------------------|-----------------------------------------|
|                                                    |                                     | <i>Feet.</i>                            |
| Gowan .....                                        | Northern R. R. ....                 | 819                                     |
| Gowanstown .....                                   | W., G. & B. R. R. ....              | 1,295                                   |
| Granton .....                                      | Grand Trunk R. R. ....              | 1,034                                   |
| Gravenhurst .....                                  | Northern R. R. ....                 | 819                                     |
| Grenville .....                                    | Q., M., O. & O. R. R. ....          | 210                                     |
| Grimaby .....                                      | Great Western R. R. ....            | 287                                     |
| Guelph .....                                       | Great Western R. R. ....            | 1,068                                   |
| Do .....                                           | W., G. & B. R. R. ....              | 1,078                                   |
| Hagersville .....                                  | Canada Southern R. R. ....          | 740                                     |
| Hamburg .....                                      | Grand Trunk R. R. ....              | 1,127                                   |
| Hamilton .....                                     | Great Western R. R. ....            | 955                                     |
| Do.. (Wentworth st. south) .....                   | H. & N. W. R. R. ....               | 377                                     |
| Do.. (Barton st) .....                             | H. & N. W. R. R. ....               | 277                                     |
| Do.. (Wentworth st. north) .....                   | H. & N. W. R. R. ....               | 266                                     |
| Harley .....                                       | Great Western R. R. ....            | 837                                     |
| Harrisburg junction .....                          | Great Western R. R. ....            | 734                                     |
| Do.... junc. (with main line G.<br>W. R. R.) ..... | W., G. & B. R. R. ....              | 734                                     |
| Do.... (track) .....                               | Great Western R. R. ....            | 734                                     |
| Harriston .....                                    | T., G. & B. R. R. ....              | 1,246                                   |
| Do .....                                           | W., G. & B. R. R. ....              | 1,264                                   |
| Harwick .....                                      | Canada Southern R. R. ....          | 651                                     |
| Hastings .....                                     | Midland R. R. ....                  | 635                                     |
| Hawtrey .....                                      | Canada Southern R. R. ....          | 706                                     |
| Hawkestone .....                                   | Northern R. R. ....                 | 779                                     |
| Hayden's Corners .....                             | Midland R. R. ....                  | 349                                     |
| Henfrye .....                                      | W., G. & B. R. R. ....              | 1,166                                   |
| Hespeller .....                                    | Wellington, Gray & Bruce R. R. .... | 942                                     |
| Hensall .....                                      | Great Western R. R. ....            | 699                                     |
| Highgate .....                                     | Canada Southern R. R. ....          | 739                                     |
| Hillaburg junction .....                           | Credit Valley R. R. ....            | 1,494                                   |
| Holland landing .....                              | Northern R. R. ....                 | 743                                     |
| Hull .....                                         | Q., M., O. & O. R. R. ....          | 185                                     |
| Hyde Park junction .....                           | Great Western R. R. ....            | 896                                     |
| Idderton .....                                     | Great Western R. R. ....            | 937                                     |
| Innerkip .....                                     | Credit Valley R. R. ....            | 972                                     |
| Ingersoll .....                                    | Great Western R. R. ....            | 879                                     |
| International bridge .....                         | Grand Trunk R. R. ....              | 588                                     |
| Inwood .....                                       | Canada Southern R. R. ....          | 691                                     |
| Iona .....                                         | Canada Southern R. R. ....          | 745                                     |
| Iroquois .....                                     | Grand Trunk R. R. ....              | 243                                     |
| Jarvis .....                                       | Great Western R. R. ....            | 701                                     |
| Do.. Loopline crossing .....                       | H. & N. W. R. R. ....               | 699                                     |
| Jordan .....                                       | Great Western R. R. ....            | 311                                     |
| Kempenfeldt .....                                  | Northern R. R. ....                 | 757                                     |
| Kemptville .....                                   | St. L. & O. R. R. ....              | 291                                     |
| Kenilworth .....                                   | T., G. & B. R. R. ....              | 1,486                                   |
| Kinloss .....                                      | W., G. & B. R. R. ....              | 1,046                                   |
| King .....                                         | Northern R. R. ....                 | 955                                     |
| Kingsey .....                                      | Grand Trunk R. R. ....              | 444                                     |
| Kingstown .....                                    | Grand Trunk R. R. ....              | 274                                     |
| Kinkardine .....                                   | W., G. & B. R. R. ....              | 590                                     |
| Kirkfield .....                                    | T. & N. R. R. ....                  | 892                                     |
| Kleinburg .....                                    | T., G. & B. R. R. ....              | 715                                     |
| Komoka .....                                       | Great Western R. R. ....            | 811                                     |
| Do.. junction .....                                | Great Western R. R. ....            | 822                                     |
| Lachute .....                                      | Q., M., O. & O. R. R. ....          | 225                                     |
| Lake Simcoe .....                                  | Northern R. R. ....                 | 722                                     |
| Lake Saint Louis .....                             |                                     | 66.75                                   |
| Lambton .....                                      | Credit Valley R. R. ....            | 412                                     |

| Station.                                                     | Authority.                    | Elevation<br>above mean<br>ocean level. |
|--------------------------------------------------------------|-------------------------------|-----------------------------------------|
|                                                              |                               | <i>Feet.</i>                            |
| Lancaster .....                                              | Grand Trunk R. R. ....        | 165                                     |
| Lansdowne .....                                              | Grand Trunk R. R. ....        | 334                                     |
| Lefroy .....                                                 | Northern R. R. ....           | 779                                     |
| Lennoxville .....                                            | Grand Trunk R. R. ....        | 500                                     |
| Lethbridge .....                                             | Northern R. R. ....           | 756                                     |
| Lewisville .....                                             | Great Western R. R. ....      | 615                                     |
| Limehouse .....                                              | Grand Trunk R. R. ....        | 1,057                                   |
| Do... siding .....                                           | Grand Trunk R. R. ....        | 1,094                                   |
| Lindsay .....                                                | Midland R. R. ....            | 851                                     |
| Lisgar .....                                                 | Grand Trunk R. R. ....        | 529                                     |
| Listowel .....                                               | W., G. & B. R. R. ....        | 1,263                                   |
| Londesburg .....                                             | Great Western R. R. ....      | 974                                     |
| London .....                                                 | Grand Trunk R. R. ....        | 815                                     |
| Do... Richmond street. ....                                  | Great Western R. R. ....      | 806                                     |
| Do... Thames river, bed .....                                | Great Western R. R. ....      | 754                                     |
| Longford .....                                               | Northern R. R. ....           | 736                                     |
| Longwood .....                                               | Great Western R. R. ....      | 752                                     |
| Lucan .....                                                  | Grand Trunk R. R. ....        | 991                                     |
| Lucknow .....                                                | W. G., & B. R. R. ....        | 910                                     |
| Luther .....                                                 | T., G. & B. R. R. ....        | 1,544                                   |
| Lyn .....                                                    | Grand Trunk R. R. ....        | 286                                     |
| Lynden .....                                                 | Great Western R. R. ....      | 757                                     |
| Lyster .....                                                 | Grand Trunk R. R. ....        | 446                                     |
| Madoc .....                                                  | Midland R. R. ....            | 584                                     |
| Maitland river (bed) .....                                   | Great Western R. R. ....      | 942                                     |
| Mallorytown .....                                            | Grand Trunk R. R. ....        | 336                                     |
| Malton .....                                                 | Grand Trunk R. R. ....        | 550                                     |
| Mandamin .....                                               | Great Western R. R. ....      | 647                                     |
| Manilla .....                                                | Midland R. R. ....            | 955                                     |
| Markdale .....                                               | T., G. & B. R. R. ....        | 1,359                                   |
| Markham .....                                                | T. & N. R. R. ....            | 640                                     |
| Mariposa (clay ridge opposite) .....                         | Midland R. R. ....            | 884                                     |
| McGowan's lake .....                                         | O. & Q. R. R. ....            | 571                                     |
| Meadsville .....                                             | Credit Valley R. R. ....      | 566                                     |
| Meaford .....                                                | Northern R. R. ....           | 674                                     |
| Melbourne .....                                              | Canada Southern Railway ..... | 735                                     |
| Michigan Air line junction .....                             | Grand Trunk R. R. ....        | 723                                     |
| Midland junction .....                                       | T. & N. R. R. ....            | 881                                     |
| Mildmay .....                                                | W., G. & B. R. R. ....        | 1,030                                   |
| Mill End .....                                               | Q., M., O. & O. R. R. ....    | 225                                     |
| Millbrook .....                                              | Midland R. R. ....            | 775                                     |
| Do... junction. ....                                         | T. & N. R. R. ....            | 772                                     |
| Millikins .....                                              | T. & N. R. R. ....            | 651                                     |
| Milton .....                                                 | H. & N. W. R. R. ....         | 661                                     |
| Do... ..                                                     | Credit Valley R. R. ....      | 663                                     |
| Mimico .....                                                 | Great Western R. R. ....      | 307                                     |
| Minessing .....                                              | Northern R. R. ....           | 619                                     |
| Mitchell .....                                               | Grand Trunk R. R. ....        | 1,122                                   |
| Moira .....                                                  | Midland R. R. ....            | 519                                     |
| Montreal (crossing Wellington street) .....                  | Grand Trunk R. R. ....        | 51                                      |
| Do... (Hochelaga street and Mon-<br>treal avenues) .....     | Q., M., O. & O. R. R. ....    | 20                                      |
| Montreal (Point St. Charles) .....                           | Grand Trunk R. R. ....        | 51                                      |
| Do... (center of Victoria bridge) .....                      | Grand Trunk R. R. ....        | 115                                     |
| Do... (St. Lawrence river, beneath<br>Victoria bridge) ..... | Grand Trunk R. R. ....        | 333                                     |
| Montebello .....                                             | Q., M., O. & O. R. R. ....    | 172                                     |
| Moorefield .....                                             | W., G. & B. R. R. ....        | 1,351                                   |
| Moore's Mine .....                                           | Midland R. R. ....            | 785                                     |
| Mount Forest .....                                           | T., G. & B. R. R. ....        | 1,350                                   |

| Station.                            | Authority.                         | Elevation<br>above mean<br>ocean level. |
|-------------------------------------|------------------------------------|-----------------------------------------|
|                                     |                                    | <i>Feet.</i>                            |
| Mount Pleasant.....                 | Great Western R. R.....            | 810                                     |
| Mount Vernon.....                   | Great Western R. R.....            | 837                                     |
| Muddy Branch.....                   | Q., M., O. & O. R. R.....          | 262                                     |
| Muirkirk.....                       | Canada Southern R. R.....          | 725                                     |
| Muskoka lake.....                   | Northern R. R.....                 | 747                                     |
| Newbury.....                        | Great Western R. R.....            | 702                                     |
| Newcastle.....                      | Grand Trunk R. R.....              | 296                                     |
| New Haven.....                      | Grand Trunk R. R.....              | 629                                     |
| New Market.....                     | Northern R. R.....                 | 772                                     |
| Newry.....                          | W., G. & B. R. R.....              | 1,204                                   |
| Newtonville.....                    | Grand Trunk R. R.....              | 294                                     |
| North Hastings junction.....        | Midland R. R.....                  | 516                                     |
| Norval.....                         | Grand Trunk R. R.....              | 819                                     |
| Norwich.....                        | Great Western R. R.....            | 844                                     |
| Nottawa.....                        | H. & N. W. R. R.....               | 707                                     |
| Oakville.....                       | Great Western R. R.....            | 340                                     |
| Oil City.....                       | Canada Southern R. R.....          | 663                                     |
| Onondaga.....                       | Grand Trunk R. R.....              | 664                                     |
| Orangeville.....                    | Credit Valley R. R.....            | 1,358                                   |
| Do.....                             | T., G. & B. R. R.....              | 1,398                                   |
| Do.....junction.....                | T., G. & B. R. R.....              | 1,616                                   |
| Orillia.....                        | Northern R. R.....                 | 726                                     |
| Oshawa.....                         | Grand Trunk R. R.....              | 333                                     |
| Ottawa.....                         | St. L. & O. R. R.....              | 133                                     |
| Owen Sound.....                     | T., G. & B. R. R.....              | 586                                     |
| Page.....                           | T., G. & B. R. R.....              | 1,283                                   |
| Paisley.....                        | W., G. & B. R. R.....              | 776                                     |
| Palmerston.....                     | W., G. & B. R. R.....              | 1,314                                   |
| Papineauville.....                  | Q. M. & O. R. R.....               | 155                                     |
| Paris.....                          | Great Western R. R.....            | 842                                     |
| Parkhill.....                       | Grand Trunk R. R.....              | 663                                     |
| Penetanguishene.....                | Northern R. R.....                 | 587                                     |
| Perch.....                          | Grand Trunk R. R.....              | 596                                     |
| Perry.....                          | Canada Southern R. R.....          | 590                                     |
| Perrytown.....                      | Midland R. R.....                  | 652                                     |
| Perth.....                          | O. & Q. R. R.....                  | 431                                     |
| Peterboro'.....                     | T. & N. R. R.....                  | 650                                     |
| Petersburgh.....                    | Grand Trunk R. R.....              | 1,211                                   |
| Phelpston.....                      | Northern R. R.....                 | 724                                     |
| Pinkerton.....                      | W., G. & B. R. R.....              | 861                                     |
| Point Clair.....                    | Grand Trunk R. R.....              | 109                                     |
| Pointe au Chêne.....                | Q., M., O. & O. R. R.....          | 188                                     |
| Poutypool.....                      | O. & Q. R. R.....                  | 1,004                                   |
| Port Colborne.....                  | Grand Trunk R. R.....              | 581                                     |
| Do.....                             | Welland R. R.....                  | 586                                     |
| Port Elgin.....                     | W., G. & B. R. R.....              | 675                                     |
| Port Hope.....                      | Grand Trunk R. R.....              | 287                                     |
| Port Huron.....                     | Grand Trunk R. R.....              | 588                                     |
| Port Perry.....                     | Midland R. R.....                  | 839                                     |
| Port Robinson.....                  | Welland R. R.....                  | 569                                     |
| Port Stanley (level Lake Erie)..... | Great Western R. R.....            | 574                                     |
| Port Union.....                     | Grand Trunk R. R.....              | 266                                     |
| Prescott.....                       | Grand Trunk R. R.....              | 310                                     |
| Do.....junction.....                | Grand Trunk R. R.....              | 303                                     |
| Preston.....                        | Wellington, Gray & Bruce R. R..... | 927                                     |
| Princeton.....                      | Great Western R. R.....            | 932                                     |
| Proton.....                         | T., G. & B. R. R.....              | 1,613                                   |
| Point Levi (opposite Quebec).....   | Grand Trunk R. R.....              | 14                                      |
| Quay's.....                         | Midland R. R.....                  | 481                                     |
| Richby.....                         | Grand Trunk R. R.....              | 819                                     |

| Station.                              | Authority.                 | Elevation<br>above mean<br>ocean level. |
|---------------------------------------|----------------------------|-----------------------------------------|
|                                       |                            | <i>Feet.</i>                            |
| Richmond .....                        | Grand Trunk R. R. ....     | 391                                     |
| Richmond Hill (gravel pit) .....      | Northern R. R. ....        | 847                                     |
| Rideau .....                          | Grand Trunk R. R. ....     | 303                                     |
| Ridgetown .....                       | Canada Southern R. R. .... | 660                                     |
| Ripley siding .....                   | W., G. & B. R. R. ....     | 807                                     |
| Rivière Baudette .....                | Grand Trunk R. R. ....     | 173                                     |
| Rockford .....                        | T., G. & B. R. R. ....     | 912                                     |
| Rockpass .....                        | Northern R. R. ....        | 777                                     |
| Rockwood .....                        | Grand Trunk R. R. ....     | 1183                                    |
| Rodney .....                          | Canada Southern R. R. .... | 693                                     |
| Saint Agassiz .....                   | Grand Trunk R. R. ....     | 406                                     |
| Saint Anne .....                      | Grand Trunk R. R. ....     | 124                                     |
| Saint Bruno .....                     | Grand Trunk R. R. ....     | 98                                      |
| Saint Catharines .....                | Great Western R. R. ....   | 357                                     |
| Do. .... (old station) .....          | Welland R. R. ....         | 375                                     |
| Saint Clair junction .....            | Canada Southern R. R. .... | 765                                     |
| Saint Cyr siding .....                | Grand Trunk R. R. ....     | 482                                     |
| Saint Hermas .....                    | Q., M., O. & O. R. R. .... | 257                                     |
| Saint Hilaire .....                   | Grand Trunk R. R. ....     | 86                                      |
| Saint Hulbert's .....                 | Grand Trunk R. R. ....     | 91                                      |
| Saint Janvier .....                   | Q., M., O. & O. R. R. .... | 220                                     |
| Saint Jerome .....                    | Q., M., O. & O. R. R. .... | 311                                     |
| Do. .... junction .....               | Q., M., O. & O. R. R. .... | 135                                     |
| Saint Julie .....                     | Grand Trunk R. R. ....     | 475                                     |
| Saint Lambert's junction .....        | Grand Trunk R. R. ....     | 76                                      |
| Saint Madeline's .....                | Grand Trunk R. R. ....     | 119                                     |
| Saint Mary's .....                    | Grand Trunk R. R. ....     | 1,033                                   |
| Saint Paul's .....                    | Grand Trunk R. R. ....     | 1,166                                   |
| Saint Rose .....                      | Q., M., O. & O. R. R. .... | 85                                      |
| Saint Scholastique .....              | Q., M., O. & O. R. R. .... | 238                                     |
| Saint Thomas .....                    | Canada Southern R. R. .... | 766                                     |
| Do. .... ..                           | Great Western R. R. ....   | 758                                     |
| Sarnia .....                          | Grand Trunk R. R. ....     | 587                                     |
| Do. water, in Saint Clair river ..... | Grand Trunk R. R. ....     | 582                                     |
| Do. (near Lake Huron) .....           | Great Western R. R. ....   | 589                                     |
| Scanlon's .....                       | Northern R. R. ....        | 741                                     |
| Scarboro junction .....               | Grand Trunk R. R. ....     | 546                                     |
| Seaforth .....                        | Grand Trunk R. R. ....     | 1,009                                   |
| Sebringville .....                    | Grand Trunk R. R. ....     | 1,173                                   |
| Seneca (Caledonia) .....              | Grand Trunk R. R. ....     | 658                                     |
| Savern .....                          | Northern R. R. ....        | 725                                     |
| Do (crossing of plank-road) .....     | H. & N. W. R. R. ....      | 653                                     |
| Do. river .....                       | Northern R. R. ....        | 711                                     |
| Shakespeare .....                     | Grand Trunk R. R. ....     | 1,184                                   |
| Sharbot lake .....                    | O. & Q. R. R. ....         | 636                                     |
| Shedden .....                         | Canada Southern R. R. .... | 726                                     |
| Shelburne .....                       | T., G. & B. R. R. ....     | 1,629                                   |
| Sherbrooke .....                      | Grand Trunk R. R. ....     | 486                                     |
| Simcoe .....                          | Great Western R. R. ....   | 719                                     |
| Somerset .....                        | Grand Trunk R. R. ....     | 442                                     |
| Southampton .....                     | W., G. & B. R. R. ....     | 516                                     |
| South Durham .....                    | Grand Trunk R. R. ....     | 609                                     |
| Southeastern R. R. junction .....     | Grand Trunk R. R. ....     | 321                                     |
| Southwold .....                       | Canada Southern R. R. .... | 745                                     |
| Springfield .....                     | Canada Southern R. R. .... | 796                                     |
| Springford .....                      | Great Western R. R. ....   | 822                                     |
| Stanford .....                        | Grand Trunk R. R. ....     | 128.25                                  |
| Stayner .....                         | Northern R. R. ....        | 717                                     |
| Stevensville .....                    | Canada Southern R. R. .... | 589                                     |
| Stirling .....                        | Midland R. R. ....         | 415                                     |



| Station.                                 | Authority.                 | Elevation<br>above mean<br>ocean level. |
|------------------------------------------|----------------------------|-----------------------------------------|
|                                          |                            | <i>Fet.</i>                             |
| Stoco lake .....                         | O. & Q. R. R. ....         | 457                                     |
| Stony Point .....                        | Great Western R. R. ....   | 587                                     |
| Stoney Creek .....                       | Great Western R. R. ....   | 275                                     |
| Stonyville .....                         | T. & N. R. R. ....         | 892                                     |
| Stratford .....                          | Grand Trunk R. R. ....     | 1,190                                   |
| Do .... (bed of Avon river) .....        | Grand Trunk R. R. ....     | 1,139                                   |
| Strathroy .....                          | Great Western R. R. ....   | 747                                     |
| Do .....                                 | Great Western R. R. ....   | 722                                     |
| Streetsville .....                       | Credit Valley R. R. ....   | 499                                     |
| Do .... junction .....                   | Credit Valley R. R. ....   | 553                                     |
| Summit .....                             | T. & N. R. R. ....         | 940                                     |
| Summit .....                             | Midland R. R. ....         | 910                                     |
| Sunderland .....                         | T. & N. R. R. ....         | 851                                     |
| Sunnidale .....                          | Northern R. R. ....        | 622                                     |
| Tavistock .....                          | Grand Trunk R. R. ....     | 1,137                                   |
| Taylor .....                             | Canada Southern R. R. .... | 723                                     |
| Tecumseh .....                           | Great Western R. R. ....   | 590                                     |
| Teeswater .....                          | T., G. & B. R. R. ....     | 1,024                                   |
| Thamesville (bed of river) .....         | Great Western R. R. ....   | 587                                     |
| Do .... bridge .....                     | Great Western R. R. ....   | 623                                     |
| Thorndale .....                          | Grand Trunk R. R. ....     | 936                                     |
| Thompson .....                           | Northern R. R. ....        | 792                                     |
| Thornbury .....                          | Northern R. R. ....        | 612                                     |
| Thornhill .....                          | Northern R. R. ....        | 633                                     |
| Thornton .....                           | H. & N.W. R. R. ....       | 942                                     |
| Thorold .....                            | Welland R. R. ....         | 553                                     |
| Thurso .....                             | Q., M. & O. R. R. ....     | 186                                     |
| Tilbury .....                            | Canada Southern R. R. .... | 592                                     |
| Tilsonburg .....                         | Canada Southern R. R. .... | 806                                     |
| Do .... crossing (Canada Southern) ..... | Great Western R. R. ....   | 797                                     |
| Toronto .....                            | Great Western R. R. ....   | 255                                     |
| Do .. (Queen st. junction) .....         | T., G. & B. R. R. ....     | 304                                     |
| Do .....                                 | Grand Trunk R. R. ....     | 254                                     |
| Do .. (Lake Ontario) .....               | Grand Trunk R. R. ....     | 246                                     |
| Trenton .....                            | Grand Trunk R. R. ....     | 265                                     |
| Tweed village .....                      | O. & Q. R. R. ....         | 571                                     |
| Tyendinaga .....                         | Grand Trunk R. R. ....     | 336                                     |
| Unionville .....                         | T. & N. R. R. ....         | 577                                     |
| Upton .....                              | Grand Trunk R. R. ....     | 204                                     |
| Uxbridge .....                           | T. & N. R. R. ....         | 877                                     |
| Vaudreuil .....                          | Grand Trunk R. R. ....     | 93                                      |
| Victoria .....                           | Canada Southern R. R. .... | 607                                     |
| Do .... junction .....                   | Midland R. R. ....         | 853                                     |
| Villa Nova .....                         | Canada Southern R. R. .... | 732                                     |
| Waldemar .....                           | T., G. & B. R. R. ....     | 1495                                    |
| Walker's .....                           | Canada Southern R. R. .... | 732                                     |
| Walkerton .....                          | W., G. & B. R. R. ....     | 933                                     |
| Wanstead .....                           | Great Western R. R. ....   | 702                                     |
| Warwick .....                            | Grand Trunk R. R. ....     | 481                                     |
| Washago .....                            | Northern R. R. ....        | 729                                     |
| Waterdown .....                          | Great Western R. R. ....   | 345                                     |
| Waterford .....                          | Canada Southern R. R. .... | 763                                     |
| Waterloo .....                           | Grand Trunk R. R. ....     | 1,858                                   |
| Waterville .....                         | Grand Trunk R. R. ....     | 646                                     |
| Watford .....                            | Great Western R. R. ....   | 787                                     |
| Welland .....                            | Canada Southern R. R. .... | 569                                     |
| Do .....                                 | Welland R. R. ....         | 602                                     |
| Weston .....                             | Northern R. R. ....        | 584                                     |
| Whitby .....                             | Grand Trunk R. R. ....     | 268                                     |
| Do .....                                 | Midland R. R. ....         | 268                                     |

| Station.               | Authority.                | Elevation<br>above mean<br>ocean level. |
|------------------------|---------------------------|-----------------------------------------|
|                        |                           | <i>Feet.</i>                            |
| Widder.....            | Grand Trunk R. R.....     | 682                                     |
| Wick's.....            | T. & N. R. R.....         | 866                                     |
| Williamsford.....      | T., G. & B. R. R.....     | 1,212                                   |
| Windsor, Ontario.....  | Great Western R. R.....   | 582                                     |
| Windsor, Quebec.....   | Grand Trunk R. R.....     | 420                                     |
| Windham.....           | Canada Southern R. R..... | 817                                     |
| Wingham.....           | Great Western R. R.....   | 1082                                    |
| Winona.....            | Great Western R. R.....   | 285                                     |
| Wolverton.....         | Credit Valley R. R.....   | 962                                     |
| Woodbridge.....        | T., G. & B. R. R.....     | 558                                     |
| Woodslee.....          | Canada Southern R. R..... | 619                                     |
| Woodstock.....         | Credit Valley R. R.....   | 947                                     |
| Do.....                | Great Western R. R.....   | 957                                     |
| Woodville.....         | T. & N. R. R.....         | 896                                     |
| Do .. junction.....    | Midland R. R.....         | 897                                     |
| Wyeville.....          | Northern R. R.....        | 772                                     |
| Wyoming.....           | Great Western R. R.....   | 712                                     |
| Yamaska river-bed..... | Grand Trunk R. R.....     | 65                                      |
| York.....              | Northern R. R.....        | 672                                     |
| Yorkville.....         | O. & Q. R. R.....         | 406                                     |

(493)

O



DEPARTMENT OF THE INTERIOR

---

BULLETINS

OF THE

UNITED STATES

GEOLOGICAL SURVEY

VOL. I



WASHINGTON  
GOVERNMENT PRINTING OFFICE  
1884



## CONTENTS.

---

| BULLETIN NO. 1.                                                                                                                                                                                                                                                         |      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
|                                                                                                                                                                                                                                                                         | Page |
| On hypersthene-andesite and on triclinic pyroxene in augitic rocks, by Whitman Cross; with a geological sketch of Buffalo Peaks, Colorado, by S. F. Emmons, Geologist-in-charge of Rocky Mountain Division.....                                                         | 1    |
| BULLETIN NO. 2.                                                                                                                                                                                                                                                         |      |
| Gold and silver conversion tables, giving the coining values of Troy ounces of fine metal, and the weights of fine metal represented by given sums of United States money, computed by Albert Williams, jr., Chief of Division of Mining Statistics and Technology..... | 43   |
| BULLETIN NO. 3.                                                                                                                                                                                                                                                         |      |
| On the fossil faunas of the Upper Devonian along the meridian of 76° 30' from Tompkins County, N. Y., to Bradford County, Pa., by Henry S. Williams ....                                                                                                                | 51   |
| BULLETIN NO. 4.                                                                                                                                                                                                                                                         |      |
| On Mesozoic fossils, by Charles A. White, M. D.....                                                                                                                                                                                                                     | 81   |
| BULLETIN NO. 5.                                                                                                                                                                                                                                                         |      |
| A dictionary of altitudes in the United States, compiled by Henry Gannett, Chief Geographer .....                                                                                                                                                                       | 125  |
| BULLETIN NO. 6.                                                                                                                                                                                                                                                         |      |
| Elevations in the Dominion of Canada, by J. W. Spencer .....                                                                                                                                                                                                            | 451  |

1

2

3

4

5

## ILLUSTRATIONS.

| BULLETIN NO. 1. |                                                                                                                               | Page. |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------|-------|
| <b>Plate</b>    | I.—Buffalo Peaks, Mosquito Range .....                                                                                        | 5     |
|                 | II.—Micro-sections of crystals .....                                                                                          | 39    |
| BULLETIN NO. 4. |                                                                                                                               |       |
|                 | I.— <i>Requienia patagiata</i> .....                                                                                          | 108   |
|                 | II.— <i>Requienia patagiata</i> and <i>R. texana</i> .....                                                                    | 110   |
|                 | III.— <i>Monopleura marcida</i> .....                                                                                         | 112   |
|                 | IV.— <i>Monopleura marcida</i> .....                                                                                          | 114   |
|                 | V.— <i>Monopleura pinguicula</i> .....                                                                                        | 116   |
|                 | VI.— <i>Cyprina</i> (?) <i>dallii</i> , <i>Aucella concentrica</i> , var., and <i>Belemnites macri-</i><br><i>tatis</i> ..... | 118   |
|                 | VII.— <i>Enclimatoceras ulrichi</i> .....                                                                                     | 120   |
|                 | VIII.— <i>Enclimatoceras ulrichi</i> .....                                                                                    | 122   |
|                 | IX.— <i>Enclimatoceras ulrichi</i> .....                                                                                      | 124   |



1. The first part of the document is a list of names and addresses of the members of the committee.

## ADVERTISEMENT.

(Bulletin 7.)

The publications of the United States Geological Survey are issued in accordance with the statute approved March 3, 1879, which declares that—

"The publications of the Geological Survey shall consist of the annual report of operations, geological and economic maps illustrating the resources and classifications of the lands, and reports upon general and economic geology and paleontology. The annual report of operations of the Geological Survey shall accompany the annual report of the Secretary of the Interior. All special memoirs and reports of said Survey shall be issued in uniform quarto series if deemed necessary by the Director, but otherwise in ordinary octavos. Three thousand copies of each shall be published for scientific exchanges and for sale at the price of publication; and all literary and cartographic materials received in exchange shall be the property of the United States and form a part of the library of the organization. And the money resulting from the sale of such publications shall be covered into the Treasury of the United States."

On July 7, 1882, the following joint resolution, referring to all Government publications, was passed by Congress:

"That whenever any document or report shall be ordered printed by Congress, there shall be printed, in addition to the number in each case stated, the "usual number" (1,900) of copies for binding and distribution among those entitled to receive them."

Under these general laws it will be seen that none of the Survey publications are furnished to it for gratuitous distribution. The 3,000 copies of the Annual Report are distributed through the document-rooms of Congress. The 1,900 copies of each of the publications are distributed to the officers of the legislative and executive departments, and to stated depositories throughout the United States.

Except, therefore, in those cases where an extra number of any publication is supplied to this office by special resolution of Congress, as has been done in the case of the second, third, fourth and fifth Annual Reports, or where a number has been ordered for its use by the Secretary of the Interior, as in the case of Williams's Mineral Resources, the Survey has no copies of any of its publications for gratuitous distribution.

### ANNUAL REPORTS.

Of the Annual Reports there have been already published:

I. First Annual Report to the Hon. Carl Schurz, by Clarence King. 1880. 8°. 79 pp. 1 map. A preliminary report describing plan of organization and publications.

II. Report of the Director of the United States Geological Survey for 1880-'81, by J. W. Powell. 1882. 8°. 1v, 588 pp. 61 pl., 1 map.

III. Third Annual Report of the United States Geological Survey, 1881-'82, by J. W. Powell. 1883. 8°. xviii, 564 pp. 67 pl. and maps.

IV. Fourth Annual Report of the United States Geological Survey, 1882-'83, by J. W. Powell. 1884. 8°. xii, 473 pp. 85 pl. and maps.

The Fifth Annual Report is in press.

### MONOGRAPHS.

So far as already determined upon, the list of the Monographs is as follows:

I. The Precious Metals, by Clarence King. In preparation.

II. Tertiary History of the Grand Cañon District, with atlas, by Capt. C. E. Dutton. Published.

III. Geology of the Comstock Lode and Washoe District, with atlas, by George F. Becker. Published.

IV. Comstock Mining and Miners, by Elliot Lord. Published.

V. Copper-bearing Rocks of Lake Superior, by Prof. R. D. Irving. Published.

VI. Older Mesozoic Flora of Virginia, by Prof. William M. Fontaine. Published.

VII. Silver-lead Deposits of Eureka, Nevada, by Joseph S. Curtis. Published.

VIII. Paleontology of the Eureka District, Nevada, by Charles D. Walcott. In press.

## ADVERTISEMENT.

IX. *Brachio-poda* and *Lamelli branchiata* of the Green Marls and Clays of New Jersey, by R. P. Whitfield.

Geology and Mining Industry of Leadville, with atlas, by S. F. Emmons. In preparation.

Geology of the Eureka Mining District, Nevada, with atlas, by Arnold Hague. In preparation.

Lake Bonneville, by G. K. Gilbert. In preparation.

Dinocerata: A Monograph on an Extinct Order of Ungulates, by Prof. O. C. Marsh. In preparation.

Sauropoda, by Prof. O. C. Marsh. In preparation.

Stegosauria, by Prof. O. C. Marsh. In preparation.

Of these Monographs, Nos. II, III, IV, V, VI, and VII are now published, viz:

II. Tertiary History of the Grand Cañon District, with atlas, by C. E. Dutton, Capt. U. S. A. 1882. 4°. 264 pp. 42 pl. and atlas of 26 double sheets folio. Price, \$10.12.

III. Geology of the Comstock Lode and Washoe District, with atlas, by George F. Becker. 1882. 4°. xv, 422 pp. 7 pl. and atlas of 21 sheets folio. Price, \$11.

IV. Comstock Mining and Miners, by Elliot Lord. 1883. 4°. xiv, 451 pp. 3 pl. Price, \$1.50.

V. Copper-bearing Rocks of Lake Superior, by Prof. R. D. Irving. 1883. 4°. xiv, 464 pp. 29 pl. Price, \$—.

VI. Contributions to the Knowledge of the Older Mesozoic Flora of Virginia, by William M. Fontaine. 1883. 4°. XIX, 144 pp. 54 l., 54 pl. Price, \$—.

VII. Silver-lead Deposits of Eureka, Nevada, by Joseph S. Curtis. 1884. 4°. XII, 200 pp. 15 pl. Price, \$—.

Nos. VIII and IX are in press and will soon appear. The others, to which numbers are not assigned, are in preparation.

## BULLETINS.

The Bulletins of the Survey will contain such papers relating to the general purpose of its work as do not properly come under the heads of ANNUAL REPORTS or MONOGRAPHS.

Each of these Bulletins will contain but one paper, and be complete in itself. They will, however, be numbered in a continuous series, and will in time be united into volumes of convenient size. To facilitate this each Bulletin will have two paginations, one proper to itself and another which belongs to it as part of the volume.

Of this series of Bulletins Nos. 1, 2, 3, 4, 5, 6, 7, and 8 are already published, viz:

1. On Hypersthene-Andesite and on Triclinic Pyroxene in Augitic Rocks, by Whitman Cross, with a Geological Sketch of Buffalo Peaks, Colorado, by S. F. Emmons. 1883. 8°. 40 pp. 2 pl. Price, 10 cents.

2. Gold and Silver Conversion Tables, giving the Coining Value of Troy Ounces of Fine Metal, &c., by Albert Williams, jr. 1883. 8°. ii, 8 pp. Price, 5 cents.

3. On the Fossil Faunas of the Upper Devonian along the Meridian of 76° 30', from Tompkins County, New York, to Bradford County, Pennsylvania, by Henry S. Williams. 1884. 8°. 36 pp. Price, 5 cents.

4. On Mesozoic Fossils, by Charles A. White. 1884. 8°. 36 pp. 9 pl. Price, 5 cents.

5. A Dictionary of Altitudes in the United States, compiled by Henry Gannett. 1884. 8°. 325 pp. Price, 20 cents.

6. Elevations in the Dominion of Canada, by J. W. Spencer. 1884. 8°. 43 pp. Price, 5 cents.

7. *Mapoteca Geologica Americana*. A Catalogue of Geological Maps of America (North and South) 1752-1881, by Jules Marcou and John Belknap Marcou. 1884. 8°. 184 pp. Price, 10 cents.

## STATISTICAL PAPERS.

A fourth series of publications, having special reference to the mineral resources of the United States, is contemplated. Of that series the first has been published, viz: *Mineral Resources of the United States*, by Albert Williams, jr. 1883. 8°. xvii, 813 pp. Price, 50 cents.

Correspondence relating to the publications of the Survey, and all remittances, which must be by postal note or money-order, should be addressed to the

DIRECTOR OF THE UNITED STATES GEOLOGICAL SURVEY,

Washington, D. C.

WASHINGTON, D. C., August 30, 1884.

DEPARTMENT OF THE INTERIOR

---

BULLETIN

OF THE

53612

UNITED STATES

GEOLOGICAL SURVEY

No. 7



WASHINGTON  
GOVERNMENT PRINTING OFFICE  
1884



UNITED STATES GEOLOGICAL SURVEY

J. W. POWELL DIRECTOR

---

# MAPOTECA GEOLOGICA AMERICANA

---

A CATALOGUE

OF

GEOLOGICAL MAPS

OF

AMERICA (NORTH AND SOUTH)

1752-1881

IN GEOGRAPHIC AND CHRONOLOGIC ORDER

BY

JULES MARCOU and JOHN BELKNAP MARCOU



WASHINGTON  
GOVERNMENT PRINTING OFFICE  
1884

1. The first part of the document is a list of names and addresses of the members of the committee.

RE 10

## CONTENTS.

|                                                                                                                                                                                                                        | Page. |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| Contractions used in references .....                                                                                                                                                                                  | 7     |
| Introduction .....                                                                                                                                                                                                     | 9     |
| I.—America in general, comprising both North and South America.....                                                                                                                                                    | 19    |
| II.—North America in general, comprising the United States, or a large<br>portion of them, and the British possessions of North America.....                                                                           | 23    |
| III.—Arctic America, comprising Greenland, Arctic Archipelago, and the<br>northernmost part of America.....                                                                                                            | 33    |
| IV.—Newfoundland.....                                                                                                                                                                                                  | 36    |
| V.—Acadia, comprising Nova Scotia (Cape Breton Island), Prince Edward<br>Island, Magdalen Islands, and New Brunswick.....                                                                                              | 39    |
| VI.—Canada proper, comprising the Province of Quebec (Anticosti Island),<br>or Lower Canada, or East Canada, and the Province of Ontario,<br>or Upper Canada, or West Canada .....                                     | 47    |
| VII.—New England, comprising Maine, New Hampshire, Vermont, Massa-<br>chusetts, Rhode Island, and Connecticut .....                                                                                                    | 52    |
| VIII.—New York and New Jersey.....                                                                                                                                                                                     | 58    |
| IX.—Pennsylvania, Delaware, and Maryland .....                                                                                                                                                                         | 64    |
| X.—Ohio, Indiana, and Michigan .....                                                                                                                                                                                   | 77    |
| XI.—Illinois, Wisconsin, Minnesota, and Iowa.....                                                                                                                                                                      | 89    |
| XII.—Southern States, comprising Virginia, West Virginia, Kentucky, Ten-<br>nessee, Mississippi, Alabama, Florida, Georgia, South Carolina,<br>and North Carolina.....                                                 | 102   |
| XIII.—Northwestern States and Territories, comprising Nebraska, Dakota,<br>Wyoming, Montana, National Park, and Idaho.....                                                                                             | 113   |
| XIV.—Northwest Territories of the British possessions, comprising Manitoba,<br>Hudson Bay Company's Territory, Saskatchewan River, or Assinni-<br>boinia, British Columbia, Vancouver and Queen Charlotte Islands..... | 117   |
| XV.—Pacific States and Territories, comprising Alaska, Washington, Oregon,<br>and California .....                                                                                                                     | 122   |
| XVI.—Central-Western States and Territories, comprising Nevada, Utah,<br>Colorado, Kansas, and Missouri.....                                                                                                           | 127   |
| XVII.—Southwestern States and Territories, comprising Arkansas, Louisiana,<br>Indian Territory, New Mexico, Texas, and Arizona.....                                                                                    | 139   |
| XVIII.—Mexico.....                                                                                                                                                                                                     | 144   |
| XIX.—West Indies or Antilles, comprising all the islands between the Baha-<br>mas and Trinidad .....                                                                                                                   | 146   |
| XX.—Central America, comprising British Honduras or Balize, Honduras,<br>Guatemala, Salvador, Nicaragua, and Costa Rica.....                                                                                           | 149   |
| XXI.—South America in general.....                                                                                                                                                                                     | 150   |
| XXII.—Ecuador, Colombia or New Granada, and Venezuela.....                                                                                                                                                             | 151   |
| XXIII.—Guiana and Brazil.....                                                                                                                                                                                          | 153   |
| XXIV.—Paraguay, Uruguay, Republica Argentina, Patagonia, Falkland Islands<br>or Islas Malvinas, and Tierra del Fuego.....                                                                                              | 154   |
| XXV.—Chili, Bolivia, and Peru .....                                                                                                                                                                                    | 156   |
| Supplement.....                                                                                                                                                                                                        | 159   |
| Alphabetical index.....                                                                                                                                                                                                | 173   |



1

## CONTRACTIONS USED IN REFERENCES.

---

Where not otherwise stated, the geological maps are in colors, and the works containing them are in octavo.

When a map contains a part of countries belonging to other great geographical divisions, as adopted in this catalogue, it is always placed in the division embracing most of its area. For instance, the "*Carte géologique des bords du Lac Champlain*," embracing parts of Vermont, New York, and Canada, is put in New England, because it covers more of Vermont than it does of Canada or New York, but in the index of places New York and Canada are referred to as countries contained in the map.

In the chronological order, when no question of priority is involved, the maps of the same year are classified in the alphabetical order of their authors.

*Amer. Journ. Silliman.*—The American Journal of Science and Arts. New Haven, Conn.

*Ann. New York Acad. Sci.*—Annals of the New York Academy of Science. New York.

*Bull. Soc. Géol. France.*—Bulletin de la Société Géologique de France. Paris.

*Geol. Surv. Canada.*—Geological Survey of Canada.

*2d Geol. Surv. Pennsylvania.*—Second Geological Survey of Pennsylvania.

*Journ. Acad. Nat. Sciences.*—Journal of the Academy of Natural Sciences of Philadelphia. 4to. Philadelphia.

*Journ. Geol. Soc. London.*—The Quarterly Journal of the Geological Society of London.

*Mem. Mus. Comp. Zool. at Cambridge.*—Memoirs of the Museum of Comparative Zoölogy at Cambridge, Mass.

*Proc. Acad. Nat. Sciences.*—Proceedings of the Academy of Natural Sciences of Philadelphia.

*Proc. Amer. Phil. Soc.*—Proceedings of the American Philosophical Society held at Philadelphia for promoting Useful Knowledge.

*Trans. Amer. Phil. Soc.*—Transactions of the American Philosophical Society held at Philadelphia for promoting Useful Knowledge. 4to.

*Trans. Amer. Inst. Mining Engrs.*—Transactions of the American Institute of Mining Engineers. Easton, Pa.

*Trans. Lit. and Hist. Soc. Quebec.*—Transactions of the Literary and Historical Society of Quebec.

*Trans. North of England Inst. Mining Engrs.*—Transactions of the North of England Institute of Mining and Mechanical Engineers. Newcastle-upon-Tyne.

*U. S. Geol. and Geogr. Surv. Territories.*—United States Geological and Geographical Survey of the Territories. Washington.

*Zeitsch. Deut. Geol. Gesells.*—Zeitschrift der Deutschen Geologischen Gesellschaft. Berlin.

## INTRODUCTION.

---

The late Uricoechea, of Bogota, when he offered me a copy of his "*Mapoteca Colombiana*"<sup>1</sup> said: "I hope that the study of this catalogue may lead you to undertake another one on the geological maps of America. Our views on the ancient geography of the world discovered by Columbus, and on the aboriginal or Indian origin of the name America,<sup>2</sup> are so harmonious, and geology being the history of the earth, a catalogue of all the geological maps published on America will be an important chapter in the history of Columbian cartography."

I have now endeavored to fulfill the wish of my friend. Taking for a model his "*Mapoteca Colombiana*," a work which is out of print and has become rare, I have united in chronologic and geographic order all the maps relating to American geology known to me.

In general, catalogues of maps are not numerous. Those of geological maps only are very rare. I know of only one purporting to comprise the maps of all the world; it is the "*Geognostische Karten unseres Jahrhunderts*." *Zusammengestellt von Bernhard Cotta, Freiberg (Saxony), 1850.* 8vo of only 60 pages. The author, although he has placed in it maps pertaining purely to physical geography, such as the geographical distribution of volcanoes, has only succeeded in enumerating 571 geognostical maps. America is placed in the last division "*VI. Ausser-Europa*," and its geological maps are united with those of Asia, Africa, Australia, and Oceania. All these large geographical divisions outside of Europe have but 53 numbers, of which 30 belong to maps on the geology of America; and several of the numbers indicate memoirs without geological maps properly so called, and some even without any kind of a map; for instance, No. 525, Finch "*Karte de Gegend von Boston*," in Silliman's *Journal of Science*, Vol. VIII, 1824, which does not exist, and is merely an error of the compiler.

Besides the catalogue of Cotta, the only list of geological maps of America is the "list of general geological maps relating to North America" in the "*Geology of North America*," by Jules Marcou, Chapter X, p. 122. 4to. Zurich, 1858. The author enumerates 23 general geological maps, in chronologic order, each comprising at least two States.

Two of the geological surveys of the United States, Dr. Hayden's and

---

<sup>1</sup> "*Mapoteca Colombiana, Coleccion de los Titulos de Todos los Mapas, Planos, Vistas, etc., relativos a la America española, Brasil e Islas adyacentes*." 8vo. Londres, 1860.

<sup>2</sup> "*Origin of the name America*," by Jules Marcou. *Atlantic Monthly*, March, 1875.

the one directed by Captain Wheeler, have given catalogues of publications, reports, and maps, in which are lists of a part of the geographical maps published by these surveys. The geological survey of Canada also has published a list of its maps.

For the last forty years especially, geological maps on America have accumulated in large numbers, thanks to the geological surveys instituted either by the general governments or by States and Provinces. The United States, Canada, Mexico, Chili, and a large number of States and Provinces have rivaled each other in this field of science. Memoir after memoir, map after map, has been produced to show the geological structure of countries which yesterday were unknown, but to-day are marshaled in the scientific movement which carries forward in its progress all the nations of the world.

Geology, properly so called, dates only from this century; in the preceding one a few maps, rather mineralogical, than geological, appeared. Such are the maps of L. Coulon in 1664; of Guettard in 1746; of Monnet on France in 1780; of Guettard on North America in 1752; of von Charpentier the elder on Saxony in 1778; of Becker on the Grand Duchy of Nassau in 1778; of von Buch on Silesia in 1797; of Hein on the Thüringen Waldes in 1799; of Christopher Packe on East Kent in 1743; of R. Frazer and J. Billingsley on Devonshire and Somerset in 1794; of Maton on the Western Counties (England) in 1797.

The first geological map is due to the abbé L. Coulon, Paris, 1664. It appeared in a little volume entitled, "*Les Rivières de France*," a very rare work, of which but very few copies exist in the libraries of Paris. In 1683 Martin Lister read a paper before the Royal Society of England entitled, "*An ingenious proposal for a new sort of maps of countries; together with tables of sands and clays, such as are chiefly found in the north part of England*"; in *Phil. Trans.*, Vol. XIV, p. 739. London, 1684. But it was only a project, which Lister did not carry into execution. The first geological map published in England is dated 1743, almost a century after Coulon's little geological map of France; its title is, "*A new Philosophico-chorographical chart of East Kent, invented and delineated by Christopher Packe, M. D.*" Scale rather more than an inch and a half to the mile, comprising a circle of about 32 miles around Canterbury.

To the celebrated Abraham Gottlob Werner is due, in great part, the coloring of geological maps; for before him several older German mineralogists had used an analogous process. Werner greatly improved not only the classification but also the plan of coloring, and proposed a method "of representing the several formations in distinct, but sober hues, and marking the superior rock by a narrow band of deeper color, along the lines of its contact with the subjacent one" (*Dr. Fitton's Notes on the History of English Geology*, London, 1833). This method of coloring was employed chiefly in Germany, in German Switzerland, a little in Scandinavia, and in England; never in France or in America.

As early as 1810 Cuvier and Brongniart, in their celebrated "*Carte Géognostique des environs de Paris*," used even tints without a "band of deeper color along the line of contact."

William Maclure, who, though a pupil of Werner, was also well acquainted with the French geological school, colored his first geological map of the United States in 1809 with even tints. Since 1832 the German school as well as the English has adopted even tints.

Curiously enough the first edition of his geological map of the United States appeared without the name of Maclure, and is sometimes credited to Samuel G. Lewis, the draftsman who compiled the geographical map on which Maclure put his geological classification and colors. This mistake and the use of a drawing by Lewis were due "to the absence (from America) of the author of "*Observations on the Geology of the United States, explanatory of a Geological Map*," read before the American Philosophical Society at Philadelphia January 20, 1809.

From 1809 to 1842 all the geological maps published on America were executed in a manner which leaves much to be desired in respect to coloring, and still more in regard to the classification of the rocks. It is only after the appearance of the "*Geological Map of the State of New York*" in 1842 that maps really possess great interest either from the value of their classifications or from the mechanical execution.

The same year a geological map of great importance, both on account of the difficulties presented by the region explored, the most elevated of the Andes, and of its central position in South America, was published by Alcide d'Orbigny under the title "*Carte Géologique de la République de Bolivie*." From that time nearly all the great geological and paleontological horizons of the New World were accepted as established, though geologists hesitated for a few years about the acceptance of the existence of several systems of stratified rocks, and also about the identification of certain paleontological horizons.

Between 1842 and 1862 there appeared a great number of geological maps of regions limited either to single countries or parts of countries, or even to a single county, or a portion of one, as well as several attempts at general maps of North America, of South America, and even of both Americas together. However, all of them have an essentially temporary character, and are geological reconnaissances. Nothing truly studied in detail and with care had then appeared. This was owing to several causes. First the total absence of good topographical maps, and often even the absence of any kind of a map, geologists being obliged to make them themselves, in order to draw and color the systems of rocks. Then the vast surfaces to be studied, the great distances to be traversed before reaching the ground to be explored, the difficult and primitive modes of transportation before the construction of lines of railroads, the wilderness and the deserts of most central continental regions, and finally the unhealthy climate of the tropics and the banks of the great rivers. All these obstacles have conspired to render

researches difficult, and to give them the character of simple geological reconnaissances. In new countries, the first thing is to obtain a sketch approximating to the truth, and afterwards to proceed to detailed studies.

It was during this period, from 1842 to 1862, that the system of coloring geological maps underwent a complete change. Till then everything was done by hand, and seldom with care. Maps were colored rapidly, and tints varied not only from one copy to another, but also on the same map, some parts being a shade lighter or darker than others; besides, traces left by the brushes added to the imperfection of the work. Finally, the overlapping of one color on another at the limits of the different systems delineated on the map often took such alarming proportions that it was impossible to tell to what formation considerable belts of country were referred. It was only by the skill derived from practice that the defects of hand-coloring were much diminished. It may be said that the geological survey of the United Kingdom of Great Britain and Ireland attained the highest possibilities of the method by forming a special corps of colorists who did nothing else for years, and by being very strict in the acceptance of the colored sheets, every one that had an apparent defect being invariably rejected.

As early as 1841 attempts at colored printing had been tried by Major Le Blanc, chief of the office of topographical engineers at Paris. This was his method: He used a sheet of tin-foil similar to that employed in the manufacture of looking-glasses, on which he fixed a proof of the map or geological section which he wished to reproduce. They were then cut out simultaneously, which gave a tin pattern of the formation. Then the color was placed on it by means of brushes prepared for the "lucidonique" method of painting, and the maps were printed under a press. This method from the first secured promptness, exactness, and cheapness of coloring.

The first sheet colored by this system of "poncis découpés," with mechanical impressions, represents "*Coupes géologiques et topographiques des environs de Paris*," made for the use of the military engineers, in the location of the fortifications of Paris, created under Louis Philippe. Shortly afterward Messrs. Le Blanc and Raulin undertook to color by this system a geological map in one sheet, "grand aigle," which appeared in 1843 with the title "*Carte géognostique du Plateau tertiaire Parisien*," by Victor Raulin. Then Major Le Blanc undertook the impression in colors of the "*Carte géologique du globe terrestre*," by Boué, in one sheet. It is dated Paris, 1845, and bears this note: "Sous les auspices et la direction de la Société géologique de France par les soins et procédés de M. Le Blanc, vice-secrétaire." The execution took longer than was expected, and the map was not given to the public until the spring of 1846. The results obtained were quite defective, both as to the character of the colors, and exactness in outline, several colors either failing to meet or overlapping each other. However, these first

attempts were quite encouraging; especially as the cost was much less than by the hand process.

In April, 1846, I offered to the *Société géologique de France* for publication in its memoirs, my work entitled "*Recherches géologiques sur le Jura Salinois*," with a geological map of the country round Salins, scale 1:80,000, taken from the "*Carte dite d'État-Major*." Having been accepted by the committee on publications, Major Le Blanc offered to try his process of mechanical coloring, his offer was accepted, and my geological map of the Jura Salinois was the first printed in color that appeared in the publications of the *Société géologique de France*. The execution occupied 1846 and 1847, and the memoir, with the map, appeared in January, 1848. It has the same defects as the map of Boué, only they are more prominent because of the large scale.

The multiplication of geological maps, and the difficulties of satisfactory and rapid coloration by hand, rendered the invention of improved methods more and more important. Dufrénoy and Élie de Beaumont, after the publication of their great geological map of France in six sheets, began the trial of lithographic coloring at the Royal press of Paris, on a map called: "*Tableau d'assemblage des six feuilles de la carte géologique de France*," in a single sheet, scale of 1:2,000,000. Previously this "*Tableau d'assemblage*," colored by hand, had been placed at the end of the first volume, 4to, of the "*Explication de la carte géologique de France*," 1841. The copies of this volume distributed from 1841 to 1853 all contain this map colored by hand. But after 1853, or at the beginning of 1854, there appeared at the end of the volume which still bears the date: "*Paris, Imprimerie Royale, MDCCCXLI*," the map of the "*Tableau d'assemblage*," with the inscription to the right at the bottom of the map; "*Lithographie de l'Imprimerie Impériale*." This chromolithographic map of the imperial press was a success; the colors are brilliant and uniform and do not overlap each other. All the copies of Volume I of the "*Explication de la carte géologique de France*," of Dufrénoy and Élie de Beaumont, since distributed, have this chromolithographic map.

Before we leave the "*Imprimerie Nationale de France*" let us mention the beautiful geological maps that have been made there, and whose execution has nowhere been surpassed, not even in these last years of progress of chromolithography. First, the "*Carte géologique de la Belgique et des contrées voisines*" by André Dumont, one sheet, 1855, a real masterpiece of coloring, especially if we consider the numerous superpositions of simple colors, which determine the greater part of the *forty-two* different tints of the *tabular view* of the map. The "*Carte géologique de l'Europe*," also by André Dumont, in four sheets, 1855-1857, is another fine example of coloring, far superior to the one made at the same time at Edinburgh by Keith Johnston for Sir Roderick Murchison's and Nicol's "*Geological Map of Europe*" in four sheets, 1856. Finally, the maps of the *État-Major*, scale of 1:80,000, used by the service of the



"*Carte géologique détaillée de la France*" have been colored by chromolithography since 1877, instead of coloring by hand employed up to that time.

Many improvements have been added to the first methods employed in 1854. The most important consists "in placing on metal by putting in relief the sheets of a map, and in operating the impression in colors under the *typographical presses*." From the Imperial press, chromolithography soon extended to private industry. In Paris, Messrs. Lemer cier & Cie. printed chromolithographically, in May, 1855, the "*Carte géologique des États-Unis et des Provinces anglaises de l'Amérique du Nord*," by Jules Marcou, and in August the "*Carte géologique du Canada*," by W. E. Logan.

In Germany analogous attempts, by means of lithographical impressions in oil colors were made at the same time. In 1842 two chromolithographic geological maps appeared, namely: "*Carte géognostique du Taurus et de ses environs*," in folio, by M. J. Russegger, published at Stuttgart; and the geological wall map of Germany by Woelter, published at Eslingen (Wurtemberg). Then in 1845 another chromolithographical map by Major Heinrich Bach, representing the geology of Wurtemberg, appeared also at Stuttgart. All these maps, as well as those that followed, show great defects, both on account of lack of clearness in the colors, all being too dark, and bad registration.

Chromolithographic geological maps appeared in Berlin and in Vienna in 1851, in the "*Zeitschrift der deutschen geologischen Gesellschaft*" and in the "*Jahrbuch der k. k. geol. Reichsanstalt*." In 1853 in Switzerland, at Winterthur, J. Wurster & Cie. chromolithographed the "*Carte géologique de la Suisse*," by B. Studer and A. Escher de la Linth. Several of the shades in this map were put on by hand, so that it was a sort of hybrid between the two systems.

In 1854, Justus Perthes, in Gotha, published a very well executed chromolithographical map; "*Geognostische Karte des Thüringer Waldes*," by H. Credner, lithographed by O. Hellfarth; and, in the same year, a map also very well executed, "*Geognostische Karte von Kurhessen*," by A. Schwarzenberg and H. Reusse, lithographed by O. Kegel, of Cassel. The last one, especially, is a success, the coloring being but little inferior to that of the geological map of France of 1853.

In America the systems of color-printing replaced but slowly the hand processes. The late A. Sonrel, the well-known draftsman of Louis Agassiz, tried a system analogous to that of Major Le Blanc, and in 1853 he successfully executed a little geological map, which appeared in a public document of the Commonwealth of Massachusetts, entitled: "*Report on certain points in the geology of Massachusetts*," by Edward Hitchcock. The map has no title, date, or place of publication, and no name of the engraver or printer. It embraces the coal field of Bristol County and of Rhode Island.

Sonrel's system consisted in cutting slips of card-board to correspond exactly with each color. These were then accurately glued to a wooden base and color applied to them by a printer's cylinder. An impression from them was then taken by a lithographic press.

In 1855 J. H. Colton & Co., of New York, engraved and printed in colors the "*Geological map of the State of Alabama*," accompanying the "Second biennial report of the geology of Alabama", which did not appear until in 1858, owing to the death of M. Tuomey, State geologist. Messrs. Colton & Co. also engraved and printed in colors the numerous maps of Oscar M. Lieber, geologist of South Carolina from 1856 to 1860.

About 1868, thanks to the celebrated cartographical house of Julius Bien, of New York, chromolithography at last came into general use in the United States for coloring geological maps. Several of the maps made by Bien are irreproachably executed and compare favorably with those made at Vienna, Munich, Berlin, Paris, London, and Bruxelles. During the civil war in the United States there was a great falling off in the publication of geological maps on that portion of America. But shortly after its termination, a new impulse of unprecedented strength, caused not only the resumption of interrupted works, but also the birth of many new ones. The Federal Government took the lead by causing the exploration of a part of the immense territories of the West. Excellent results have already been obtained, and the important geological atlases published during the last few years under the direction of Messrs. Clarence King, F. V. Hayden, J. W. Powell, and George M. Wheeler, are an honor to the Government of the United States, and to the geologists who constructed them. The States of Michigan, Wisconsin, Ohio, Missouri, New Hampshire, and Pennsylvania have also published large geological atlases, well executed in chromolithography. The Dominion of Canada has continued with improved success its publication of geological maps of the British Possessions in North America. Finally, British Guiana, Brazil, the Argentine Republic, and Chili have undertaken geological surveys, which, in the last twenty years, have largely augmented our knowledge of the geology of South America. The geological map of Chili, in thirteen sheets, by Pissis, published chromolithographically in Paris, compares favorably with any atlas published in North America.

Geological mapping in this country was greatly improved between 1862 and 1881, without, however, attaining that degree of perfection reached by the old and very detailed geological surveys of England, France, Switzerland, Belgium, Austria, Prussia, or Scandinavia. Although the latest geological publications on America are very superior to those which preceded them, there has not been executed a geological survey of any large area that is really final, or that leaves but little to be corrected in the future. With limited exceptions, all are geological reconnaissances, which still demand many years of work to transform them into definite and completed studies. However,

what exists already is enormous in importance and in extent, when we consider the immense stretch of land explored, from the Arctic to the Antarctic regions.

In judging the results obtained by the efforts of, after all, a rather small band of field geologists, we must not lose sight of the fact that America occupies a hemisphere, and that, compared with the Old World, the New is better known geologically, and has far less blank space on a general geological map than Asia, Africa, or Australia.

In looking over this catalogue, one will often be struck by certain peculiarities in the maps cited. Some are anonymous, others have no titles, some have no date, others have no scale, or a scale which has to be figured out to understand it exactly; in this case we have not cited the scale. Often no place of publication is given; even whole geological atlases are without such designation. Very often the date on the map does not correspond to the date of the book or memoir which describes it; in which case I have mentioned both dates, first that of the map and then that of the book. Finally, I have had to eliminate a certain number of maps called geological in their titles, which really have nothing geological about them. I have also neglected citing very small maps reduced from larger ones, which authors of elementary books have inserted in their texts in black engravings or wood cuts; for they are all reproductions—often very poor ones—of maps made by original observers, whose names are neither on these maps nor in the texts. They are merely for the use of the general public and student, and are without value in the history of science. Unfortunately no kind of publication offers greater temptations for appropriating the work of others without proper credit, than a geological map. It is offered in excuse that the knowledge belongs to the public, but geologists who respect the property of their fellow-workers, and who know that often the only recompense of very difficult work, without any pecuniary remuneration whatever, is the reputation derived from it, do not fail to cite the name or the names of the first explorers or investigators, either on the maps or in the explanatory text, or in both. Too often this simple rule of justice is violated, and numerous acts of real scientific piracy exist in geological cartography. The persons most often guilty of it are mining engineers, geographers, and travelers. Thus, one often finds in the narrative of a voyage, or in mining magazines, large geological maps, well colored and tolerably exact, with the name of an author wholly unknown in geology. If these maps are compared with those of the geologists who have made a study of the countries represented, it is surprising to find that they are exact copies, so exact indeed that they repeat faults known only to their authors. In this case the evil is not great, for every one rectifies the error and places the name of the true author in the place of that of the unscrupulous compiler.

But it is not the same thing when the author of the compilation is a known geologist. It then becomes very difficult to know what really

belongs to the geological predecessors and pioneers whose works have been appropriated without citing them. But very few scientists are capable of re-establishing the truth, and often when they know it they dislike to make it public and expose the piracy of a fellow scientist. The only remedy for this evil is the reputation which each one possesses in science. He who respects and cites all the maps and works of his predecessors is sure of having the reputation of an honest observer, even when his works are disagreeable to some of his co-laborers. While he who appropriates right and left the works of others is soon known and cited as an unscrupulous compiler, and of doubtful standing as a geologist.

Almost all the geological maps cited in this "Mapoteca" are in my library—especially all the pioneer maps, a few of which are very rare, and command a high price.

The public libraries of Cambridge and of Boston have allowed us to complete what we lacked. There is only a very small number of maps, hardly a dozen, that I have not seen, and in this case I have always added the word *unseen*. Some of these even I have seen in European libraries nearly thirty years ago, at a time when I did not think of making a catalogue.

Notwithstanding all the care and diligence with which I have searched for years, a number of geological maps of America must have escaped me, as happens in all catalogues, but I believe that nothing important will be found wanting.

This list stops with the year 1881, inclusive.

JULES MARCOU.

CAMBRIDGE, MASS., *September*, 1882.

(17)

Bull. 7—2



**I. — AMERICA IN GENERAL, COMPRISING BOTH NORTH AND SOUTH AMERICA.**

**1.**

**1843—Boué (Ami).** Carte géologique du globe terrestre. Paris, 1845.

In one sheet only. America is colored geologically, with the data then known, which covered only about one-twelfth of the whole continent. The rest is mere conjecture. It is a bold attempt at generalization with a small basis of facts. It was republished by Edward Hitchcock, without the name of Boué, under the title of "Outline of the geology of the globe." 1853. Accompanying "Outline of the geology of the globe, and the United States in particular", by Edward Hitchcock. Boston, 1854.

An English edition, by A. K. Johnston, appeared in 1855 in his Physical atlas of natural phenomena, Plate I, under the title "The geological structure of the globe according to Ami Boué." Edinburgh, 1855.

A German edition, in Berghaus Physikalischer Atlas, appeared in 1856? Plate 9, under the title "Geologische Erdkarte nach Ami Boué und K. Johnston von Traugott Bromme." Stuttgart, 1856?

**2.**

**1848—Taylor (R. C.).** Chart showing the position of the coal fields on the surface of the globe.

Accompanying "Statistics of coal." Philadelphia, 1848.

A second edition was published by Haldeman.

**3.**

**1849—Buch (Leopold von).** Die Verbreitung und die Grenzen der Kreide-Bildungen. Mercator projection.

Accompanying "Betrachtungen über die Verbreitung und die Grenzen der Kreide-Bildungen"; Verhandlungen des naturhistorischen Vereins der Preussischen Rheinlande und Westphalens. Bonn, 1849.

A very small map, showing, in black etching, the geographical distribution of the cretaceous rocks in North and South America. Also issued separately.

**4.**

**1853—Hitchcock (Edward).** Outline of the geology of the globe.

Accompanying "Outline of the geology of the globe, and the United States in particular." Boston, 1854.

See Boué (Ami), 1843—No. 1.

**5.**

**1855—Boué (Ami).** The geological structure of the globe according to Ami Boué.

Accompanying "Physical atlas of natural phenomena", by A. K. Johnston, Plate I. Edinburgh, 1855.

See Boué (Ami), 1843—No. 1.

## 6.

- 1856—**Boué** (Ami) and **Johnston** (K.). Geologische Erdkarte nach Ami Boué und K. Johnston von Traugott Bromme.

Accompanying "Berghaus Physikalischer Atlas," Plate IX. Stuttgart, 1856?

See **Boué** (Ami), 1843—No. 1.

## 7.

- 1860—**Marcou** (Jules). Geological map of the world Carte géologique de la terre. Scale 1: 23,000,000. Winterthur (Switzerland), 1861.

In eight sheets. In this map localities of which the geology was unknown were left blank. Reductions of it appeared in **Élisée Reclus** "La Terre," Vol. I, Les continents. "Carte géologique du Monde, d'après Jules Marcou." Plate II, p. 30. Paris, 1868. Of this there are four editions. By an oversight of the translator, Mr. Henry Woodward, the author's name was omitted in the English editions entitled "The Earth," by **Élisée Reclus**.

Prof. **Oscar Fraas** reproduced a reduction of the first edition of this map in his "Vor der Sündfluth," Stuttgart, 1865, with the author's name omitted; in the subsequent editions of his work he repaired his forgetfulness. In 1872 a reduction of the first edition, in one sheet, appeared in Vienna, in the "Physikalische Karten," published by **Artaria & Co.** under the title "Geologische Uebersichtskarten der Erde nach Marcou."

## 8.

- 1865—**Marcou** (Jules). Geological map of the world (reduction of).

Accompanying "Vor der Sündfluth," by **Oscar Fraas**. Stuttgart, 1865.

See **Marcou** (Jules), 1860—No. 7.

## 9.

- 1867—**Simonin** (Louis). Carte des terrains houillers du globe et de l'exportation du charbon anglais d'après Taylor, Marcou et les documents officiels.

Accompanying "La vie souterraine, ou les mines et les mineurs." Carte I, p. 32. Paris, 1867.

It is a reduction of **R. C. Taylor's** chart, with additions from the first edition of **Marcou's** Geological map of the world.

## 10.

- 1868—**Marcou** (Jules). Carte géologique du monde d'après Jules Marcou.

Accompanying "La Terre," by **Élisée Reclus**, Vol. I, Plate II, p. 30. Paris, 1868.

See **Marcou** (Jules), 1860—No. 7.

## 11.

- 1870—**Marcou** (Jules). Carte géologique du monde.

Accompanying "La Terre," by **Élisée Reclus**, 2d edition, Plate II. Paris, 1870.

See **Marcou** (Jules), 1860—No. 7.

## 12.

**1871—Marcou (Jules).** Geological map of the world.

Accompanying "The Earth," by Élisée Reclus, Plate II. London, 1871.

The name of Jules Marcou has been dropped, not by the translator, Mr. Henry Woodward, but by the publisher.

See Marcou (Jules), 1860—No. 7.

## 13.

**1872—Marcou (Jules).** Geologische Uebersichtskarten der Erde, nach Marcou.

Accompanying "Physikalische Karten," published by Artaria & Co. Vienna, 1872.

See Marcou (Jules), 1860—No. 7.

## 14.

**1874—Marcou (Jules).** Geological map of the world.

Accompanying "The Earth," by Élisée Reclus, 2d edition, Plate II. London, 1874.

See Marcou (Jules), 1860—No. 7.

## 15.

**1874—Marcou (Jules).** Carte géologique du monde.

Accompanying "La Terre," by Élisée Reclus, Plate II. German edition. (Berlin), 1874.

See Marcou (Jules), 1860—No. 7.

## 16.

**1875—Marcou (Jules).** Geological map of the world. Carte géologique de la terre. Scale 1: 23,000,000. Zurich, 1875.

Second edition, in eight sheets. North and South America are almost all colored, and many corrections and additions have been made. A reduction appeared in the fourth edition of Élisée Reclus's "La Terre," and also in translations and subsequent editions of the same work.

## 17.

**1875—Marcou (Jules).** Carte géologique de la terre, réduction et assemblage des huit feuilles.

Accompanying "Explication d'une seconde édition de la carte géologique de la terre." 4°. Zurich, 1875.

## 18.

**1876—Marcou (Jules).** Carte géologique du monde.

Accompanying "La Terre," by Élisée Reclus. Italian edition, from which the name of E. Reclus has been expunged. —, 1876.

See Marcou (Jules), 1875—No. 16.

## 19.

**1876—Marcou (Jules).** Carte géologique du monde.

Accompanying "La Terre," by Élisée Reclus, 3<sup>ème</sup> édition, Plate II. Paris, 1876.

See Marcou (Jules), 1860.—No. 7.



## 20.

1876—**Marcou (Jules).** Carte géologique du monde.

Accompanying "La Terre," by *Élisée Reclus*. Carte géologique II. Magyar edition. Buda Pesth (Hungary), 1876.

See *Marcou (Jules)*, 1875—No. 16.

## 21.

1877—**Marcou (Jules).** Carte géologique du monde d'après *Jules Marcou*.

Accompanying "La Terre," by *Élisée Reclus*, 4<sup>ème</sup> edition, Plate II, p. 26. Paris, 1877.

See *Marcou (Jules)*, 1875—No. 16.

## 22.

1877—**Marcou (Jules).** Geological map of the world.

Accompanying "The Earth," by *Élisée Reclus*, 3d edition, Plate II. London, 1877.

See *Marcou (Jules)*, 1875—No. 16.

## 23.

1878—**Marcou (Jules).** Carte géologique du monde.

Accompanying "La Terre," by *Élisée Reclus*. Carte II. Russian edition. St. Petersburg, 1878.

See *Marcou (Jules)*, 1875—No. 16.

(22)

**II.—NORTH AMERICA IN GENERAL, COMPRISING THE UNITED STATES, OR A LARGE PORTION OF THEM, AND THE BRITISH POSSESSIONS OF NORTH AMERICA.**

24.

**1752—Guettard (Jean Étienne).** Carte minéralogique où l'on voit la nature des terrains du Canada et de la Louisiane.

Accompanying "Mémoire dans lequel on compare la Canada à la Suisse par rapport à ses minéraux." Histoire de l'Académie Royale des sciences, 4<sup>o</sup>, p. 189, Plate VII. Paris, 1752.

A map extending from Florida to the 60th parallel of latitude north.

This very curious first "Geological Map of a part of North America," shows the geographical distribution of three large belts of rocks, which Guettard called "Bandes sablonneuse, marneuse, et schisteuse ou métallifère." The marly or clay belt is marked by a shaded zone, extending from the shores of Texas, on the Gulf of Mexico, toward the northeast as far Cape Breton Island, called Isle Royale; then it turns northwest toward Quebec. West of this band lay the schistose or metalliferous belt, and east of it the sandy belt under the sea-level.

Thirty-nine different signs and annotations indicate places where rocks and minerals exist between the Atlantic and the Rocky Mountains. On a smaller map, placed at the right-hand lower corner, on a larger scale, comprising the shores of the St. Lawrence River, Guettard points out eight localities containing fossils, which he figures on Plates 3 and 4. One is evidently an *Orthis*, and another a *Leptæna*, related to *Leptæna sericea*, both found on the shores or near Lake Champlain. Besides, Guettard gives figures of *Crinoidæ* and a tooth of the *Mastodon giganteum*, found on the banks of the Ohio River, in 1739, by Longueil, an officer of the French army, who collected there (Big bone Lick) bones, teeth, and tusks which still exist carefully kept among the collections of Comparative Anatomy at the "Jardin des Plantes," in Paris. The map was constructed by Philippe Buache for M. Guettard.

25.

**1809—Maclure (William).** A map of the United States, colored geologically.

Accompanying "Observations on the Geology of the United States, explanatory of a Geological Map." Trans. Amer. Phil. Soc., Vol. VI, p. 411. Philadelphia, 1809.

This was published during the author's absence in Europe, and he was much dissatisfied with it.

26.

**1811—Maclure (William).** Carte des États-Unis de l'Amérique-Nord, pour servir aux observations géologiques.

Accompanying "Observations sur la Géologie des États-Unis." (Journ. de Phys., de Chim., d'Hist. Nat. et des Arts, par J. C. Delamétherie, Vol. LXXII.) Paris, 1811.

For a fac-simile of this map see 1858—No. 54.

(23)

## 27.

1817—Maclure (William). Map of the United States of America, designed to illustrate the Geological Memoir of Wm. Maclure, esq.

Accompanying "Observations on the Geology of the United States of America." Trans. Amer. Phil. Soc., New Series, Vol. I. 4°. Philadelphia, 1817.

This geological map and the explanatory memoir are better known than the first map of 1809 or the French edition of 1811, and are generally considered as the starting point for the geology of North America. Also issued separately in 8°.

## 28.

1822—Cleaveland (Parker). (Geological Map) The United States.

Accompanying "An elementary treatise on Mineralogy and Geology, designed as a companion for travelers in the United States of America." Second edition in two volumes, p. 784, Vol. II, Plate VI. Boston, 1822.

This old geological map of the United States is merely a copy of the third edition of 1817, of Maclure's Geological Map, with very few additions or variations.

## 29.

1822—Long (S. H.) and James (Edwin). Map of the country drained by the Mississippi, western section.

Accompanying "Account of an expedition from Pittsburgh to the Rocky Mountains, performed in the years 1819 and 1820, under the command of Major S. H. Long," compiled by Edwin James, geologist to the expedition, 2 vol. and 4° atlas. Philadelphia, 1823.

In black, with dotted lines and geologic inscriptions indicating limits of the formations as understood then by Edwin James.

Although very rough, this first sketch of the geology of the country west of the Mississippi River, by Dr. Edwin James, is very creditable, and entitles him to be called the first pioneer of the geology of the country between the Mississippi River and the eastern foot of the Rocky Mountains. The volumes appeared in 1823 the atlas in 1822.

## 30.

1842—Owen (D. D.). Geological chart of the Ohio Valley.

Accompanying "On the geology of the Western States of North America." As a postponed paper in Journ. Geol. Soc., London, Vol. II, p. 433. London, 1846.

This map was published in order to establish satisfactorily his just claims of original discoverer of many important points in the geology of the Western States, two maps having appeared in 1843, by B. Lawrence and J. Hall, covering almost the same ground, without reference to the survey of David Dale Owen, from which they were compiled almost entirely.

## 31.

1843—Lawrence (Byrem). A geological map of the Western States.

[No place of publication]. 1843. Lithographed in Boston.

This very rare map is merely a copy of David Dale Owens' geological map of the Ohio Valley.

## 32.

- 1843—Hall (James).** Geological map of the Middle and Western States. Accompanying "Geology of New York," Part IV, comprising the survey of the fourth geological districts. 4to. Albany, 1843; also issued separately.

## 33.

- 1843—Moxon (Charles).** Sketch of the geology of the United States. Accompanying "On the geology of the United States." In the Geologist for the year 1843, edited by C. Moxon. Frontispiece. London, 1843. A very rough reproduction and reprint of Maclure's geological map.

## 34.

- 1845—Lyell (Sir Charles).** Geological map of the United States, Canada, &c. Accompanying "Travels in North America in the years 1841-42." London and New York, 1845. This map appeared May 14th, 1845. It is important, giving for the first time a general view of the geology of North America.

## 35.

- 1846—Lyell (Sir Charles).** Geognostische Karte der Vereinigten Staaten, Canada, &c. Accompanying "Reisen in Nord-Amerika von Charles Lyell. Deutsch, von Dr. Emil Th. Wolff." Halle, 1846.

## 36.

- 1848—Wislizenus (A.).** Geological sketch of a tour from Independence to Santa Fé, Chihuahua, Monterey, and Matamoros. Accompanying "Memoir of a tour to Northern Mexico, connected with Colonel Doniphan's expedition in 1846 and 1847." Washington, 1848. Black, with geological indications only.

## 37.

- 1851—Owen (D. D.), Norwood (J. G.), and Whittlesey (Charles).** Geological map of Wisconsin, Iowa, and Minnesota, exhibiting also the extension of the Iowa coal field into Missouri, and its relation to the Illinois coal field. Accompanying "Report of a geological survey of Wisconsin, Iowa, and Minnesota and incidentally of a portion of Nebraska Territory," by D. D. Owen. Vol. of illustrations. 4°. Philadelphia, 1852. A very important map for the upper Mississippi region. On the same large sheet, at the upper right-hand corner, there is also a "Geological map of the north shore of Lake Superior".

## 38.

- 1851—Owen (D. D.), Norwood (J. G.), and Whittlesey (Charles).** Geological map of the north shore of Lake Superior. Accompanying "Report of a geological survey of Wisconsin, Iowa, and Minnesota and incidentally of a portion of Nebraska Territory," by D. D. Owen. Vol. of illustrations. 4°. Philadelphia, 1852. See the preceding map—No. 37.

## 39.

**1852—Buch (Leopold von). Geognostische Karte von Nord-America.**

Accompanying "Ueber die Juraformation auf der Erdoberfläche" in Monatsbericht der königlichen Akademie der Wissenschaften zu Berlin. Berlin, 1853.

It is the last memoir by the celebrated Prussian geologist. The map is on a very small scale, and was also issued separately.

## 40.

**1853—Marcou (Jules). Geological map of the United States and the British provinces of North-America.**

Accompanying "A geological map of the United States and the British provinces of North America, with an explanatory text, geological sections, and plates of the fossils which characterize the formation." Boston, July, 1853.

A French translation has appeared under the title "Carte géologique des États-Unis et des provinces Britanniques de l'Amérique du Nord." Accompanying "Voyage dans l'Amérique du Nord en 1853 et 1854, par Guillaume Lambert, Bruxelles, mars 1855. This map is the first which gives the distribution of the strata, according to the nomenclature of Murchison and de Verneuil, into lower and upper Silurian and Devonian; it also extends beyond the Mississippi as far as the Rocky Mountains.

## 41.

**1853—Hitchcock (Edward). A geological map of the United States and Canada.**

Accompanying "Outlines of the geology of the globe, and of the United States in particular, with two geological maps, and sketches of characteristic American fossils." Boston, 1854.

Sketch map made up by combining Boué's "Geological map of the world," with Charles Lyell and Jules Marcou's "Geological map of the United States and Canada."

This map first appeared in October, 1853. Another issue was made in 1854.

## 42.

**1854—Hitchcock (Edward). A geological map of the United States and Canada.**

Second issue of the above-mentioned map—No. 41.

## 43.

**1855—Logan (W. E.). Carte géologique du Canada. Scale: lieues de 25 au degré dont une = 4445 m.**

Accompanying "Esquisse géologique du Canada pour servir à l'intelligence de la carte géologique envoyée à l'Exposition universelle de Paris en 1855" par W. E. Logan et T. Sterry Hunt, in 12°. Paris, 1855.

This map is also published in the "Bull. Soc. géol. France, 2<sup>e</sup> série, tom. XII, page 1316. More than half of this map is of the United States.

## 44.

**1855—Logan (W. E.).** Carte géologique du Canada. Scale, lieues de 25 au degré dont une = 4445 m.

Accompanying "Bull. Soc. géol. France," 2<sup>e</sup> série, tom. XII, p. 1316. Paris, 1855.

The same as the map mentioned above; a few copies were presented to the Geol. Soc. of France, and inserted in its Bulletin.

## 45.

**1855—Lyell (Sir Charles).** Geological map of the United States, Canada, &c. London, 1855.

Second English edition. See Lyell (Sir Charles), 1845—No. 34.

## 46.

**1855—Marcou (Jules).** Carte géologique des Etats-Unis et des provinces Britanniques de l'Amérique du Nord.

Accompanying "Voyage dans l'Amérique du Nord en 1853 et 1854", par Guillaume Lambert. Bruxelles, 1855.

See Marcou (Jules), 1853—No. 40.

## 47.

**1855—Marcou (Jules).** Carte du terrain Carbonifère dans une partie de l'Amérique du Nord.

Accompanying "Le terrain Carbonifère dans l'Amérique du Nord". La Bibliothèque universelle de Genève, Juin, 1855. Genève, 1855.

Black etching.

## 48.

**1855—Marcou (Jules).** Geologische Karte der Vereinigten Staaten und Britischen Provinzen von Nord-Amerika. Scale, 1:14,000,000.

Accompanying "Ueber die Geologie der Vereinigten Staaten und der Englischer Provinzen von Nord-Amerika." Petermann's Geographische Mittheilungen. Vol. I. Gotha, 1855.

Published July, 1855. It is the first geological map comprising the whole country from the Atlantic to the Pacific Oceans, the author being the first geologist to cross the continent with a Government expedition—the Pacific Railroad exploration. He was able to give said data by the 35th parallel of latitude from Arkansas to San Francisco.

## 49.

**1855—Marcou (Jules).** Carte géologique des États-Unis et des provinces anglaises de l'Amérique du Nord.

Accompanying "Résumé explicatif d'une carte géologique des États-Unis et des provinces anglaises de l'Amérique du Nord." Bull. Soc. géol. France, tome XII, p. 813. Paris, 1855.

The number of the Bulletin for May, 1855, did not appear till the beginning of 1856. On this account the author, to prevent delays and in order to take date for his discoveries in the far West, had a German edition published in Petermann's Geographische Mittheilungen. This map also appeared in the Annales des Mines, tome VII, p. 329. Paris, 1855.

## 50.

- 1855—**Marcou (Jules).** Carte géologique des États-Unis et des provinces anglaises de l'Amérique du Nord.

Accompanying "Esquisse d'une classification des chaînes de montagnes d'une partie de l'Amérique du Nord. Annales des Mines, 5<sup>e</sup> série, tome VII, p. 320, Plate IX. Paris, 1855.

See **Marcou (Jules)**, 1855—No. 49.

## 51.

- 1855—**Rogers (H. D.).** Geological map of the United States and British North America.

Accompanying "Physical Atlas of Natural Phenomena," by Keith Johnston. Folio, Plate VIII. Edinburgh, 1856.

Published the 1st of July, 1856.

## 52.

- 1857—**Hall (James), and Lesley (J. P.).** Map illustrating the general geological features of the country west of the Mississippi.

Accompanying "Report on the United States and Mexican Boundary Survey," by W. H. Emory. 4°. Vol. I, Part II, p. 1. Washington, 1857.

## 53.

- 1853—**Mackie (S. J.).** Remnants of Primeval Lands, North America.

Accompanying "The remnants of the first life world and the bottom rocks." In "The Geologist," a popular monthly magazine of geology, edited by S. J. Mackie, p. 288. London, 1858.

## 54.

- 1853—**Maclure (W.).** Carte des États-Unis de l'Amérique du Nord, pour servir aux observations géologiques.

Accompanying "Geology of North America," by Jules Marcou. 4°. Zurich, 1858.

This is a copy on a somewhat smaller scale of the Paris edition of 1811.

See **Marcou (Jules)**, 1858—No. 55.

## 55.

- 1858—**Marcou (Jules).** Carte géologique des États-Unis et des provinces anglaises de l'Amérique du Nord.

Accompanying "Geology of North America, with two reports on the prairies of Arkansas and Texas, the Rocky Mountains of New Mexico, and the Sierra Nevada of California." 4°. Zurich, 1858.

A reduction of this map, combined with the first edition of the "Geological map of the world," by the same author, is placed at the lower corner on the left-hand side of the sheet of "Geologie und Physikalische Karten," containing "Geologische Uebersichts-Karte der Erde nach Marcou, etc.," published by Artaria & Co. Vienna, 1872.

See **Marcou (Jules)**, 1872—No. 66.

## 56.

- 1861—**Hayden (F. V.).** Outline reduction of the maps of Kansas, Nebraska, and Dakota. Scale, 60 miles to the inch.

Accompanying "On the geology and natural history of the Upper Missouri. Trans. Amer. Phil. Soc. 4°. Vol. XII, new series, article I, p. 218. Philadelphia, 1863.

## 57.

- 1861—Humphreys (A. A.), and Abbot (H. L.).** Map of the alluvial region of the Mississippi. Scale 1 : 1,500,000.

Accompanying "Report upon the physics and hydraulics of the Mississippi River," Professional Papers of the Corps of Topographical Engineers, United States Army, No. 4. 4°. Plate II, U. S. Mississippi Delta Survey. Philadelphia, 1861.

Very important and reliable map, not only in regard to the geological distribution of the alluvium, but also in regard to the delta and the mouth of the Mississippi.

## 58.

- 1864—Green (W., jr.).** Map showing the relation of the anthracite coal region to the great Appalachian coal-field, according to Leslie.

Accompanying "Notes on the anthracite coal region of North America. Trans. North of England Inst. Mining Engrs., Vol. XIII, p. 25. Newcastle-upon-Tyne, 1864.

## 59.

- 1864—Logan (Sir W. E.).** Geological map of Canada and the adjacent region, including parts of the British provinces, and of the United States.

Accompanying "Geol. Surv. of Canada, report of progress, from its commencement to 1863". Atlas of maps and sections, with an introduction and appendix I. Montreal, 1865.

Only one-sixth of the map is truly Canadian. In the map appears a Quebec group, comprising the Calciferous and Chazy limestone, and placed below the Trenton group and above the Potsdam. In the volume "Geology of Canada," the same Quebec group is placed above the Trenton group, and as a part of the Utica and Hudson River.

## 60.

- 1867—Marcou (Jules).** Carte des houillères des États-Unis d'après J. Marcou.

Accompanying "La vie souterraine, ou les mines et les mineurs," par Louis Simonin. 4°. Carte X, p. 112. Paris, 1867.

It is a reduction of Marcou's "Carte géologique des États-Unis et des Provinces anglaises de l'Amérique du Nord" of 1858.

## 61.

- 1867—Simonin (Louis).** Carte des gîtes miniers des États de la Californie et Nevada.

Accompanying "La vie souterraine, ou les mines et les mineurs." Carte XII, p. 432. Paris, 1867.

A reduction of a part of Marcou's "Carte géologique des États-Unis et des Provinces anglaises de l'Amérique du Nord" of 1858. It covers Oregon and some parts of Utah and Arizona.

## 62.

- 1867—Simonin (Louis).** Carte de la région métallifère du Lac Supérieur d'après Rogers et Marcou.

Accompanying "La vie souterraine, ou les mines et les mineurs." Carte XIV, p. 436. Paris, 1867.



## 63.

1869—Forster (J. W.). Geological sketch of the United States.

Accompanying "Resources of the Mississippi Valley." Page 272. Chicago, 1869. Black etching, covers one octavo page only.

## 64.

1871—Credner (Herman). Geognostische Karte des Alleghany-Systems.

Nach den vorhandenen Arbeiten sowie eignen Untersuchungen. Maasstab 1:6,000,000.

Accompanying "Die Geognosie und der Mineralreichthum des Alleghany-Systems." Erläuternder Text zur geognostischen Karte. Petermann's Geographische Mittheilungen. 4°. Vol. XVII, Taf. III. Gotha, 1871.

## 65.

1872—Hitchcock (C. H.) and Blake (W. P.). Geological map of the United States, compiled for the 9th Census. Washington, 1872.

The same as the map published in 1874.

See Hitchcock (C. H.) and Blake (W. P.), 1874—No. 70.

## 66.

1872—Marcou (Jules). Carte Géologique des États-Unis et des provinces anglaises de l'Amérique du Nord.

Accompanying "Physikalische Karten Geologie," published by Artaria & Co., on sheet containing "Geologische Uebersichtskarte der Erde nach Marcou." Vienna, 1872.

See Marcou (Jules), 1858—No. 55.

## 67.

1873—Hitchcock (C. H.) and Blake (W. P.). Geological map of the United States.

Accompanying "Statistics of mines and mining in the States and Territories west of the Rocky Mountains," being the fifth annual report of Rossiter W. Raymond, p. 480. Washington, 1873.

See Hitchcock (C. H.) and Blake (W. P.), 1874—No. 70.

## 68.

1873—Macfarlane (James). Map showing the coal fields of the United States.

Accompanying "The coal regions of America." New York, 1873.

Black etching.

## 69.

1874—Hitchcock (C. H.). Map of the coal fields of the United States, compiled from State reports.

Accompanying "Statistical atlas of the United States, based on the results of the Ninth Census, 1870, compiled under authority of Congress," by Francis A. Walker. Plates XI and XII. folio. Washington, 1874.

## 70.

- 1874—Hitchcock (C. H.) and Blake (W. P.).** Geological map of the United States, compiled from sources mentioned in the text.

Accompanying "Statistical atlas of the United States, based on the results of the Ninth Census, 1870, compiled under authority of Congress," by Francis A. Walker. Plates XIII and XIV. folio. Washington, 1874.

This map is wanting in uniformity of classification and clearness of definitions, not only for the rocks, but also for the colors, which do not represent the same formation on the right as on the left of the map; several copies dated 1872, with the following alteration in the title, "compiled for the Ninth Census," were privately distributed. It was distributed also at the Centennial Exhibition of Philadelphia, 1876, with the "Special report of the Smithsonian Institution." So it may be considered as an official "Geological map of the United States." It was also published in 1877 in "Gray's Atlas of the United States and the World." folio. Philadelphia.

See Hitchcock (C. H.) and Blake (W. P.), 1872—Nos. 65 and 67.

## 71.

- 1874—Wrigley (H. E.).** Special oil report map A. Scale, 50 miles to the inch.

Accompanying "2nd Geo. Surv. of Pennsylvania." "Special Report on the Petroleum of Pennsylvania," Vol. J. Harrisburg, 1875.

Black etching, showing oil region of Eastern United States and Canada.

## 72.

- 1875—Hitchcock and Blake.** Die Steinkohlenfelder der Vereinigten Staaten von N. A., nach der Karte von Hitchcock und Blake. Maasstab 1:13,500,000.

Accompanying "Statistische Uebersicht der Steinkohlengewinnung in der Nord-Amerikanischen Union." Von Alb. G. Gatschet in New-York. Petermann's Geographische Mittheilungen. 4°. Vol. XXI, 1875, Taf. XVI.

## 73.

- 1876—Boyd (E. F.).** Geological map of the United States.

Accompanying "Remarks on the coal measures and oil produce of the United States of America, collected during a visit to that country in the autumn of 1875." Trans. North of England Inst. Mining Engrs., Vol. XXV, Plate XLIII, p. 188. Newcastle-upon-Tyne, 1876.

A rough copy of the map, published under authority of Congress, in Francis A. Walker's statistical atlas of the United States.

## 74.

- 1876—Boyd (E. F.).** Map of the coal fields of the United States.

Accompanying "Remarks on the coal measures and oil produce of the United States of America, collected during a visit to that country in the autumn of 1875." Trans. North of England Inst. Mining Engrs., Vol. XXV, Plate XLIV. Newcastle-upon-Tyne, 1876.

## 75.

- 1876—Bradley (F. H.). Geological chart of the United States east of the Rocky Mountains, and of Canada. New Haven, 1875.  
A student's map in black etching.

## 76.

- 1876—Hitchcock (C. H.) and Blake (W. P.). Geological map of the United States.

Accompanying "Special report of the Smithsonian Institution for the Centennial." Washington, 1876.

See Hitchcock (C. H.) and Blake (W. P.), 1874—No. 70.

## 77.

- 1877—Hitchcock (C. H.) and Blake (W. P.). Geological map of the United States.

Accompanying "Atlas of the United States and the world," by Gray. Folio. Philadelphia, 1877.

See Hitchcock (C. H.) and Blake (W. P.), 1874—No. 70.

## 78.

- 1878—Ratzel (Friedr.). Geologische Karte der Vereinigten Staaten.

Accompanying "Die Vereinigten Staaten von Nord-Amerika, Vol. I, p. 28. München, 1878.

Perhaps a reduction of 3rd issue of the map by Hitchcock & Blake?

## 79.

- 1879—Macfarlane (J.). Geological sketch of the United States.

Accompanying "An American geological railway guide, giving the geological formation at every railway station," p. 216. New York, 1879.

In black etching and numbers. Very small, occupying one octavo sheet.

## 80.

- 1879—Vivian (A. P.). Geological map from Colorado to the Pacific. Scale 45 miles to the inch.

Accompanying "Wanderings in the western land." London, 1879.

Not seen.

## 81.

- 1881—Hilgard (E. W.). Map illustrating paper on the tertiary of the Gulf of Mexico.

Accompanying "The later tertiary of the Gulf of Mexico." Amer. Journ. Silliman, 3d series, Vol. XXII, Plate III. New Haven, 1881.

## 82.

- 1881—Hitchcock (C. H.). Geological map of the United States. Scale, 20 miles to the inch. New York, 1881.

With a pamphlet, a wall map 13 feet long and 8 feet wide; the largest geological map yet published of the United States and Canada.

**III.—ARCTIC AMERICA, COMPRISING GREENLAND, ARCTIC ARCH-  
IPELAGO, AND THE NORTHERNMOST PART OF AMERICA.**

83.

**1851—Richardson (Sir John).** Map of the physical geography and geology of the Arctic regions.

Accompanying "Arctic searching expedition; a journal of a boat-voyage through Rupert's land and the Arctic Sea, in search of the discovery ships, under command of Sir John Franklin." 2 vols. London, 1851.

84.

**1855—Isbister (A. K.).** Geological sketch map of the northernmost parts of America.

Accompanying "On the geology of the Hudson's Bay Territories, and of portions of the Arctic and northwestern regions of America." In the Journ. Geol. Soc. London, Vol. XI, p. 497. London, 1855.

85.

**1855—Isbister (A. K.).** Geological sketch map of the northernmost parts of America.\*

Accompanying "On the occurrence of numerous fragments of fir-wood in the islands of the Arctic Archipelago, with remarks on the rock specimens brought from that region," by Sir Roderick T. Murchison. From the Journ. Geol. Soc. London, Vol. XI, p. 536. London, 1855.

\* This map was published in November of the same year, to accompany a separate issue of the above-mentioned memoir.

86.

**1857—Haughton (S.).** Discoveries in the Arctic Sea up to MDCCLIV.

Accompanying "Reminiscences of Arctic ice travel in search of Sir John Franklin and his companions," by Capt. F. L. McClintock. With geological notes and illustrations by Rev. Samuel Haughton. Journal of the Royal Dublin Society, Feb., 1857. Dublin, 1857.

87.

**1859—Haughton (S.).** Geological map of the Arctic Archipelago.

Accompanying "A narrative of the Discovery of the fate of Sir John Franklin and his companions," by Capt. F. L. McClintock, p. 372. London, 1859.

In black etching, and covering more ground than the issue of 1857.

(33)

## 88.

- 1860—Lieber (O. M.).** Sketch showing the geology of the coast of Labrador. Scale, 1 : 5,000,000.

Accompanying "Notes on the geology of the coast of Labrador," by Oscar M. Lieber, August, 1860 (sketch No. 38). Report of the Superintendent of the U. S. Coast Survey, showing the progress of the survey during the year 1860. 4°. Washington, 1861.

Black etching.

## 89.

- 1861—Lieber (O. M.).** Die Küste von Labrador. Nach den bisherigen Englischen Aufnahmen, den Untersuchungen der Missionäre und handschriftlichen Mittheilungen von Oscar M. Lieber. Maasstab, 1 : 4,000,000.

Accompanying "Die Amerikanische astronomische Expedition nach Labrador in July, 1860." Petermann's Geographische Mittheilungen, Vol. VII, 1861, Taf. IX. 4°. Gotha, 1861.

## 90.

- 1874—Rhode (J. G.) and Steenstrup (K. J. V.).** Geognostische Uebersichtskarte der Küsten des Waigattes in Nord-Grönland. Maasstab, 1 : 710,000.

Accompanying "Bemerkungen zu der Geognostischen Uebersichtskarte der Küsten des Waigattes in Nord-Grönland," von K. J. V. Steenstrup. (Geographie und Esforschung der Polarregionen, Nr. 89.) Petermann's Geographische Mittheilungen, Vol. XX, 1874, Taf. VII. Gotha, 1874.

Appeared also in Videnskabelige Meddelelser fra den naturhistoriske Forening i Kjobenhavn, 1874 and 1875, p. 74; and in the Mineralogical Magazine, Vol. I, p. 143. London and Truro, 1877.

## 91.

- 1874—Rhode (J. G.) and Steenstrup (K. J. V.).** (Geognostische Uebersichtskarte der Küsten des Waigattes in Nord-Grönland.)

Accompanying "Videnskabelige Meddelelser fra den naturhistoriske Forening i Kjobenhavn," 1874 and 1875, p. 74. Kjobenhavn, 1874.

See Rhode (J. G.) and Steenstrup (K. J. V.), 1874—No. 90.

Not seen.

## 92.

- 1876—Steenstrup (K. J. V.).** Geognostisk Kaart over en Del af Julianehaabs Distrikt i Syd-Groenland.

Accompanying "A. Expeditionen til Julianehaabs Distrikt i 1876." Meddelelser om Groenland, Andet Hefte, p. 112. Kjobenhavn, 1881.

## 93.

- 1877—Rhode (J. G.) and Steenstrup (K. J. V.).** Geognostische Uebersichtskarte der Küsten des Waigattes in Nord-Grönland.

Accompanying "The Mineralogical Magazine," Vol. I, p. 143. "On the non-meteoritic origin of the masses of metallic iron in the basalt of Diako, Greenland." Selected and translated from the original Danish paper by K. J. V. Steenstrup, by J. G. Rhode, traveling companion to the author on his expedition in 1872. London and Truro, 1877.

In the copy seen there is no map.

## 94.

**1878—Feilden (H. W.) and De Rance (O. E.).** Sketch map showing the geology of Grinnell Land and the neighboring regions.

Accompanying "Geology of the coasts of the Arctic lands visited by the late British expedition, under Captain Sir George Nares." Journ. Geol. Soc. London, Vol. XXXIV, p. 556. London, 1878.

Black etching.

## 95.

**1879—Kornerup (A.).** Geologisk Kaartskizze over Kystlandet fra Godthaab til Tiningnertok.

Accompanying "Geologiske Iagttagelser fra Vestkysten af Groenland." Meddelelser om Groenland, Foerst Hefte, Kaart B. Kjobenhavn, 1879.

## 96.

**1879—Kornerup (A.).** Geologisk Kaartskisse over Gnejsens Strygningslinjer fra Kangatsiak til Holstensborg.

Accompanying "B. Expeditionen til Holstensborgs og Egedesminde Distrikter i 1879." Meddelelser om Groenland, Andet Hefte, p. 149. Kjobenhavn, 1881.

#### IV.—NEWFOUNDLAND.

97.

**1824—Cormack (W. E.). Map of Newfoundland.**

Accompanying "Account of a journey across the island of Newfoundland." Edinburgh Philosophical Journal, Vol. X, Plate VI, page, 156. Edinburgh, 1824.

Black, with geological indications.

98.

**1842—Bonnycastle (Sir Richard H.). Newfoundland, in 1842, considered in its geological and statistical relations.**

Accompanying "Newfoundland in 1842." 2 vols. 12°. London, 1842.

Black, with geological indications and notes.

Jukes has priority of Bonnycastle, who took advantage of and copied Jukes' official report to the Newfoundland Government.

99.

**1842—Jukes (J. B.). Map of the island of Newfoundland.**

Accompanying "Excursions in and about Newfoundland during the years 1839 and 1840," by J. B. Jukes. 2 vols. London, 1842.

Black, with geological inscriptions and signs.

See Jukes (J. B.), 1843—No. 100.

100.

**1843—Jukes (J. B.). Map of the island of Newfoundland (geologically colored).**

Accompanying "General report of the geological survey of Newfoundland during the years 1839 and 1840." London, 1843.

About a quarter of the whole island is colored geologically; the rest is left in blank, as unknown. An important work. The same map, but not geologically colored, only with the geological inscriptions and signs, accompanies "Excursions in and about Newfoundland during the years 1839 and 1840," by J. B. Jukes. In two volumes. London, 1842.

101.

**1866—Murray (Alex.). Plan of Belvie Bay (Newfoundland). Scale, 2 miles to 1 inch.**

Accompanying "Report on the geology of Newfoundland for 1865," p. 24. Montreal, 1866.

Black, with geological indications.

(36)

## 102.

- 1870—Murray (Alex.).** Map of an exploration of the Bay East River, Newfoundland. Scale, 4 statute miles to 1 inch.

Accompanying "Report upon the geological survey of Newfoundland for the year 1870." St. John's, Newfoundland, 1870.

Black, with geological indications.

## 103.

- 1873—Murray (Alex.).** Geological map of Newfoundland. London, 1873.

The first complete geological map of the whole island. No date of publication on the map; but a small explanatory tract or label attached to it says July, 1873.

## 104.

- 1873—Murray (Alex.) and Howley (J. P.).** Map showing the distribution of the coal formation, &c., St. George's Bay, Newfoundland.

Accompanying "Report of progress for the year 1873, Geological survey of Newfoundland." Montreal, 1873.

Black, with dotted lines and geological indications.

## 105.

- 1874—Gilpin (E.).** Sketch of the Carboniferous district of St. George's Bay, Newfoundland.

Accompanying "Notes on the Coalmeasures and lower Carboniferous strata of Western Newfoundland." Trans. North of England Inst. Mining Engrs., Vol. XXIII, Plate XXXV. Newcastle-upon-Tyne, 1874.

Black etching and geological indications.

## 106.

- 1874—Murray (Alex.).** Map of Gander River and Lake. Scale, 4 miles to 1 inch.

Accompanying "Geological survey of Newfoundland; report of progress for the year 1874." St. John's, Newfoundland, 1875.

Black, with geological indications.

## 107.

- 1874—Murray (Alex.) and Howley (J. P.).** Map showing the distribution of the Silurian and Carboniferous formation, &c., in St. George's and Port à Port Bays, Newfoundland. Scale, 4 miles to 1 inch.

Accompanying "Geological survey of Newfoundland; report of progress for the year 1874." St. John's, Newfoundland, 1875.

Black, with dotted lines and geological indications.

## 108.

- (1879)—Murray (Alex.) and Howley (J. P.)** Geological map of Newfoundland. London (1879).

There is no date of publication on the map. I received a copy from the author in July, 1880.



## 109.

**1881—Murray (Alex.) and Howley (J. P.)** Peninsula of Avalon, showing distribution of formations. Scale, 4 miles to 1 inch.

Accompanying "Geological survey of Newfoundland; report of progress for the year 1881." St. John's, Newfoundland, 1882.

A large, important geological map of the eastern part of the island.

## 110.

**1881—Howley (J. P.)**. Section map showing the corrugation effecting the stratification of the Huronian formation near Brigus, Conception Bay. Scale, 4 inches to 1 mile.

Accompanying "Geological survey of Newfoundland; report of progress for the year 1881." St. John's, Newfoundland, 1882.

**V.—ACADIA, COMPRISING NOVA SCOTIA (CAPE BRETON ISLAND),  
PRINCE EDWARD ISLAND, MAGDALEN ISLANDS, AND NEW  
BRUNSWICK.**

111.

- 1828—Jackson (C. T.) and Alger (Francis).** A geological map of part of Nova Scotia. Scale, 10 miles to  $\frac{5}{8}$  of an inch.

Accompanying "A description of the mineralogy and geology of a part of Nova Scotia." Amer. Journ. Silliman, Vol. XIV. New Haven, 1828.

Also in the Memoirs of the American Academy of Science, 1832. 4°. Cambridge.

112.

- 1832—Baddeley (F. F.).** Outline of the Magdalen Islands, with geological notes.

Accompanying "On the Magdalen Islands." In Trans. Lit. and Hist. Soc. Quebec. Vol. II. Quebec, 1836.

113.

- 1832—Jackson (C. T.) and Alger (Francis).** A geological map of part of Nova Scotia. Scale, 10 miles to  $\frac{5}{8}$  of an inch.

Accompanying "A description of the mineralogy and geology of a part of Nova Scotia." Memoirs of the American Academy of Science. 4to. 1832. Cambridge, 1832.

See Jackson (C. T.) and Alger (Francis), 1828—No. 111.

114.

- 1836—Gesner (Abraham).** A new map of Nova Scotia and Cape Breton, Prince Edward Island, and part of New Brunswick.

Accompanying "Remarks on the geology and mineralogy of Nova Scotia," by A. Gesner. Halifax, 1836.

No author's name on the map.

115.

- 1841—Jackson (C. T.) and Alger (F.).** A new pocket map of the peninsula of Nova Scotia, intended as a topographical guide, also to illustrate its geological structure. (Boston), 1841.

No place of publication is given, but Boston is undoubtedly the place and Francis Alger was the editor.

116.

- 1843—Gesner (Abraham).** Geological map of Nova Scotia.

Accompanying "On the geology of Cape Breton," by Richard Brown, and "In the lower carboniferous rocks or gypsiferous formation of Nova Scotia," by J. W. Dawson. Journ. Geol. Soc. London, Vol. I, p. 23. London, 1845.

See Dawson (J. W.), 1845—No. 119.

(39)

117.

**1843—Gesner (Abraham).** Geological map of Nova Scotia.

Accompanying "A geological map of Nova Scotia"; also, "On the geology of Cape Breton," by Richard Brown, and "On the lower carboniferous rocks of Nova Scotia," by J. W. Dawson. *Proceed. of the Geol. Soc. of London*, Vol. VI, pp. 186, 269, and 272." London, 1846.

A part of the map was colored by Messrs. R. Brown and J. W. Dawson, and the geological map by C. T. Jackson and Alger of 1828 was used.

118.

**1845—Dawson (J. W.).** Geological map of part of Nova Scotia.

Accompanying "On the newer coal formation of the eastern part of Nova Scotia." *Journ. Geol. Soc. London*, Vol. I, p. 322. London, 1845.

See Dawson (J. W.), 1845—No. 119.

119.

**1845—Dawson (J. W.).** Geological map of part of Nova Scotia.

Accompanying "On the newer coal formation of the eastern part of Nova Scotia." In *Proceed. of the Geol. Soc. of London*, Vol. IV, p. 504. London, 1846.

This map and A. Gesner's geological map of Nova Scotia were issued twice, first in Vol. IV of the *Proceedings* and then in Vol. I of the *Journal of the Geological Society*. No explanation is given of the double issue of maps and of the accompanying memoirs.

120.

**1847—Dawson (J. W.).** Map and sections of new red sandstone of Nova Scotia.

Accompanying "On the new red sandstone of Nova Scotia." *Journ. Geol. Soc. London*, Vol. IV, p. 50. London, 1848.

Black etching.

121.

**1848—Taylor (R. C.).** Map of the New Brunswick, Nova Scotia, Cape Breton, and Newfoundland coal fields.

Accompanying "Statistics of coal," p. 208. Philadelphia, 1848.

122.

**1850—Bobb (J.).** Geological map of New Brunswick.

Accompanying "Report on the agricultural capabilities of the province of New Brunswick," by James F. W. Johnston. Fredericton, 1850.

The main sources of information for the construction of this map are two manuscript maps by Abraham Gesner, formerly provincial geologist.

123.

**1851—Jackson (C. T.).** A geological map of the Albert Coal Mines and the surrounding strata.

Accompanying "Report on the Albert Coal Mine" (New Brunswick). (Boston), 1851.

Black, with geological indications.

(40)

124.

- 1855—Dawson (J. W.).** Geological map of Nova Scotia, Prince Edward Island, and part of New Brunswick.

Accompanying "Acadian geology: an account of the geological structure and mineral resources of Nova Scotia and portions of the neighbouring provinces of British America." Edinburgh, 1855.

The first edition of an important geological map and work.

125.

- 1860—Dawson (J. W.).** No title.

Accompanying "On the Silurian and Devonian rocks of Nova Scotia." The Canadian Naturalist and Geologist, Vol. V, p. 133. Montreal, 1860.

Black etching.

126.

- 1863—Matthew (G. F.).** Map of the vicinity of St. John, New Brunswick.

Accompanying "Observations on the geology of St. John County, New Brunswick." The Canadian Naturalist and Geologist, p. 8, Montreal, 1863.

Black etching.

127.

- 1864—Bailey (L. W.).** Geological map of the Tobique and Nepisiquit Rivers, New Brunswick.

Accompanying "Notes on the geology and botany of New Brunswick." The Canadian Naturalist and Geologist, new series, Vol. I, p. 81. Montreal, 1864.

Black etching.

128.

- 1864—Bailey (L. W.) and Matthew (G. F.).** Geological map of the counties of St. John, Kings, Queens, and Albert, New Brunswick, showing the position and extent of each formation, from the Carboniferous basin to the coast.

Accompanying "Observations on the geology of Southern New Brunswick, made principally during the summer of 1864," by L. W. Bailey, George F. Matthew, and C. F. Hart. Fredericton, 1865.

An important map and memoir.

129.

- 1865—Bailey (L. W.) and Matthew (G. F.).** Geological map of the counties of St. John, Kings, Queens, and Albert, New Brunswick, showing the position and extent of each formation, from the Carboniferous basin to the coast.

Accompanying "On the Azoic and Paleozoic rocks of Southern New Brunswick," by G. F. Matthew. Journ. Geol. Soc. London, Vol. XXI, p. 422. London, 1865.

Black etching.

(41)

130.

**1865—Bailey (L. W.). Geological map of Grand Manan.**

Accompanying "On the physiography and geology of the island of Grand Manan" (New Brunswick). *The Canadian Naturalist and Geologist*, Vol. VI, p. 43. Montreal, 1865.  
Black etching.

131.

**1865—Hedley (Edward). Geological map of the province of Nova Scotia, including the island of Cape Breton.**

Accompanying "On the iron mines and iron manufacture of Nova Scotia." *Trans. North of England Inst. Mining Engrs.*, Vol. XIV, Plate I, p. 15. Newcastle-upon-Tyne, 1865.

132.

**1866—Honeyman (D.). (Geological) map of Antigonish County.**

Accompanying "Geology of Antigonish County, Nova Scotia." *Proceed. and Trans. of the Nova Scotian Institute of Natural Sciences of Halifax, Nova Scotia*. Vol. I, p. 106. Halifax, 1867.

133.

**1868—Dawson (J. W.). Sketch map of Pictou coal district.**

Accompanying "Acadian geology," 2d edition, p. 320. London, 1868.  
Black etching and inscriptions.

134.

**1868—Dawson (J. W.). Map of Cape Breton coal fields.**

Accompanying "Acadian geology," 2d edition, p. 413. London, 1868.  
Black etching and inscriptions.

These two maps of Dawson are copied in black etching, on a reduced scale wood cuts, in "Coal regions of America," by James Macfarlane, New York, 1873.

135.

**1868—Dawson (J. W.). Geological map of Nova Scotia, New Brunswick, and Prince Edward's Island. Scale, 25 miles to the inch.**

Accompanying "Acadian geology," 2d edition and 3d edition. London, 1868 and 1878.

136.

**1869—Robb (Charles). Sketch map of the counties of York, Carleton, and part of Victoria, province of New Brunswick. Scale, 8 miles to 1 inch.**

Accompanying "Geological survey of Canada. Report of progress from 1866 to 1869," p. 173. Montreal, 1870.  
Black, with geological indications.

(42)

## 137.

- 1870—Hind (H. Y.).** Sketch maps from the Atlantic at Halifax to the St. Lawrence.

Accompanying "On two Gneissoid series in Nova Scotia and New Brunswick, supposed to be the equivalent of the Huronian and Laurentian." *Journ. Geol. Soc. London*, Vol. XXVI, p. 478. London, 1870.

Three sketches in black etchings.

## 138.

- 1870—Logan (Sir W. E.), and Hartley (E.).** Geological map of the Pictou coal field, province of Nova Scotia. Scale, 1 inch to a mile.

Accompanying "Geological survey of Canada, report of progress from 1866 to 1869," p. 3. Montreal, 1870.

## 139.

- 1870—Rutherford (John).** Map of Nova Scotia, showing the Carboniferous formation and position of the coal fields.

Accompanying "The coal fields of Nova Scotia." *Trans. North of England Inst. Mining Engrs.*, Vol. XIX, Plate XXV, p. 114. Newcastle-upon-Tyne, 1870.

Black etching.

## 140.

- 1870—Rutherford (John).** Map of portion of the Pictou coal field.

Accompanying "The coal fields of Nova Scotia." *Trans. North of England Inst. Mining Engrs.*, Vol. XIX, Plate XXVII, p. 122. Newcastle-upon-Tyne, 1870.

Black, with geological indications.

## 141.

- 1871—Brown (Richard).** Geological map of Cape Breton.

Accompanying "The coal fields and coal trade of the Island of Cape Breton." *Frontispiece*. London, 1871.

## 142.

- 1871—Brown (Richard).** Map of the Sydney coal field.

Accompanying "The coal fields and coal trade of the Island of Cape Breton," p. 166. London, 1871.

## 143.

- 1871—Dawson (J. W.).** Geological map of Prince Edward Island.

Accompanying "Report on the geological structure and mineral resources of Prince Edward Island," by J. W. Dawson, assisted by B. J. Harrington. Montreal, 1871.

## 144.

- 1873—Dawson (J. W.).** Sketch map of Pictou coal district.

Accompanying "Coal regions of America," by James Macfarlane. New York, 1873.

Black etching. A reduction of Dawson's map of 1868.

See Dawson (J. W.), 1868—No. 133.

145.

**1873—Dawson (J. W.).** Map of Cape Breton coal field.

Accompanying "Coal regions of America," by James Macfarlane. New York, 1873.

Black etching. A reduction of Dawson's map of 1868.

See Dawson (J. W.), 1868—No. 134.

146.

**1873—Gilpin (E.).** Pictou coal field. Scale, two-thirds of an inch equal one mile.

Accompanying "The Pictou coal field." Trans. North of England Inst. Mining Engrs., Vol. XXII, Plate XXXIII, p. 139. Newcastle-upon-Tyne, 1873.

Black etching and geological indications.

147.

**1875—Gilpin (E.).** Sketch map Sydney coal field from admiralty chart.

Accompanying "The submarine coal of Cape Breton, Nova Scotia." Trans. North of England Inst. Mining Engrs., Vol. XXIV, Plate XXXIV. Newcastle-upon-Tyne, 1875.

Black etching.

148.

**1875—Robb (C.) and Fletcher (H.).** Geological map of Cape Dauphin district, Cape Breton, Nova Scotia. Scale, four inches to a mile.

Accompanying "Report on explorations and surveys in Cape Breton, Nova Scotia." Geological Surv. of Canada; report of progress for 1874-75, p. 251. Montreal, 1875.

149.

**1875—Robb (C.) and Fletcher (H.).** Geological map of the Sydney coal field, Cape Breton, Nova Scotia. Scale, one inch to a mile.

Accompanying "Report of explorations and surveys in Cape Breton, Nova Scotia," by H. Fletcher. Geol. Surv. Canada; report of progress for 1875-76, p. 418. Montreal, 1877.

150.

**1875—Routledge (W.).** Coal area map or plan of the Sydney coal field, Cape Breton County, Nova Scotia.

Accompanying "Notes on the Sydney coal field in the Island of Cape Breton, British North America." Trans. North of England Inst. Mining Engrs., Vol. XXIV, Plate XXXVI. Newcastle-upon-Tyne, 1875.

151.

**1876—Bailey (L. W.) and Ellis (R. W.).** Geological map of the lower carboniferous rocks of Albert and Westmoreland Counties, New Brunswick, showing the distribution of the Albert shales. Scale, one inch to a mile.

Accompanying "Report on the lower carboniferous belt of Albert and Westmoreland Counties, N. B., including the 'Albert shales.'" Geol. Surv. Canada; report of progress for 1876-77, p. 351. Montreal, 1878.

(44)

152.

- 1876—Ells (R. W.).** Map shewing the distribution of iron ores of Carleton County, New Brunswick.

Accompanying "Report on the iron ore deposits of Carleton County, New Brunswick." Geol. Surv. Canada; report of progress for 1874-75, p. 97. Montreal, 1876.

Black, with geological indications.

153.

- 1876—Fletcher (H.).** Geological map of part of Cape Breton, Nova Scotia, from North Sydney and Sydney River to Great Bras d'Or and St. Anne Harbor. Scale, one inch to a mile.

Accompanying "Report on the geology of part of the counties of Victoria, Cape Breton, and Richmond, Nova Scotia." Geol. Surv. Canada; report of progress for 1876-77, p. 456. Montreal, 1878.

154.

- 1876—Robb (C.) and Fletcher (H.).** Geological map of the Sydney coal field, Cape Breton, Nova Scotia. Scale, one inch to a mile.

Accompanying "Report on exploration and surveys in Cape Breton, Nova Scotia." Geol. Surv. Canada; report of progress for 1874-75, p. 266. Montreal, 1875.

155.

- 1877—Gilpin (E.).** Geological map of Nova Scotia, shewing relative positions of the iron ores, limestones and coal fields, based on the geological map prefixed to second edition of Dr. Dawson's *Acadian Geology*.

Accompanying "The iron ores of Nova Scotia." Trans. North of England Inst. Mining Engrs., Vol. XXVI, Plate IX. Newcastle-upon-Tyne, 1877.

156.

- 1877—Gilpin (E.).** Geological map of part of Pictou County, Nova Scotia, from surveys of Sir William Logan and the writer.

Accompanying "The iron ores of Nova Scotia." Trans. north of England Inst. Mining Engrs. Vol. XXVI, Plate VIII. Newcastle-upon-Tyne, 1877.

157.

- 1878—Dawson (J. W.).** Geological map of Nova Scotia, New Brunswick, and Prince Edward's Island. Scale, 25 miles to the inch.

Accompanying "Acadian geology," 3d edition. London, 1878.

The map is precisely the same as that in the 2d edition, published in 1868.

See Dawson (J. W.), 1868—No. 135.

158.

- 1879—Fletcher (H.).** Geological map of part of Cape Breton, Nova Scotia, to illustrate Report for 1877-8. Scale, one inch to a mile.

Accompanying "Reports of explorations and surveys in Cape Breton, Nova Scotia." Geol. Surv. Canada; report of progress for 1877-78, atlas. Montreal, 1879.

(45)



159.

**1880—Bailey (L. W.), Matthew (G. F.), and Ellis (R. W.).** Province of New Brunswick. Scale, 4 miles to one inch, or 1:253,440.

Accompanying "Report on the geology of southern New Brunswick, embracing the counties of Charlotte, Sunbury, Queens, King, St. John, and Albert." Geol. Surv. Canada; report of progress for 1878-79. Montreal, 1880.

The southern part of New Brunswick, No. 1, in three sheets, Nos. 1, S. W., 1, S. E., and 1, N. E.

This map is remarkably well executed.

160.

**1881—Gilpin (Edwin).** Sketch map, approximate distribution of the carboniferous series of Nova Scotia and New Brunswick.

Accompanying "The gypsum of Nova Scotia." Trans. North of England Inst., Mining Engrs., Vol. XXX, Plate XII, p. 68. Newcastle-upon-Tyne, 1881.

(46)

**VI—CANADA PROPER, COMPRISING THE PROVINCE OF QUEBEC  
(ANTICOSTI ISLAND) OR LOWER CANADA OR EAST CANADA,  
AND THE PROVINCE OF ONTARIO OR UPPER CANADA OR  
WEST CANADA.**

161.

- 1829—Badddeley (F. F.).** Sketch of the river Saguenay and Lake St. John, to which are added a few geognostical notes.  
Accompanying "Geognosy of a part of the Saguenay country." In Trans. Literary and Historical Soc., Quebec, Vol. I. Quebec, 1829.  
Black, with geological indications.

162.

- 1852—Logan (W. E.).** Geological map of a part of Canada.  
Accompanying "On the foot-prints occurring in the Potsdam sandstone of Canada." Journ. Geol. Soc., London, Vol. VIII, p. 199. London, 1852.  
This map is of a part of Canada East.

163.

- 1853—Bigsby (J. J.).** Geological map of the vicinity of Quebec.  
Accompanying "On the geology of Quebec and its environs." Journ. Geol. Soc., London, Vol. IX, p. 82. London, 1853.  
Black etching.

164.

- 1856—Logan (W. E.).** Plan showing the distribution of crystalline limestones of the Laurentian series, between Grenville and Rawdon. Scale, 3 miles to an inch.  
Accompanying "Geol. Surv. Canada; reports of progress for the years 1853-56", p. 38. Toronto, 1857.

165.

- 1856—Richardson (James).** Plan of the Island of Anticosti. Scale, 9 miles to an inch.  
Accompanying "Geol. Surv. Canada; report of progress for the years 1853-56", p. 234. Toronto, 1857.  
Black, with dotted lines, letters, and indications.

166.

- 1857—Murray (Alex.).** Plans of Bonne Chère, Madawaska, and Shashkong Rivers, and sources of the Ottonabee. Scale, 80 chains to an inch.  
Accompanying "Geological Reports of Canada for 1853, '54, '55, '56." Grand folio atlas. Toronto, 1857.  
In four sheets. Black, with geological indications.

## 167.

**1857—Murray (A.) and Logan (W. E.).** Plans shewing explorations on the north shore of Lake Huron and thence eastward to the Ottawa. Scale, 80 chains to an inch.

Accompanying "Geographical Reports of Canada for 1853, '54, '55, '56." Grand folio atlas. Toronto, 1857.

In eleven sheets. Black, with geological indications.

## 168.

**1857—Murray (A.) and Logan (W. E.).** Plans shewing explorations between the east shore of Lake Huron and the Ottawa River, Maganatawan River, and Muskoka and Petewahweh Rivers. Scale, 80 chains to an inch.

Accompanying "Geological Reports of Canada for 1853, '54, '55, '56." Grand folio atlas. Toronto, 1857.

In seven sheets. Black, with geological indications.

## 169.

**1857—Richardson (James).** Plan showing the distribution of the Devonian and Silurian formations in a part of Gaspé. Scale, 6 miles to an inch.

Accompanying "Geol. Surv. Canada; report of progress for the year 1857", p. 270. Toronto, 1858.

Black, with dotted lines and geological indications.

## 170.

**1857—Richardson (J.) and Barlow (S.).** Topographical plan of Magdalen River.

Accompanying "Geol. Surv. Canada; report of progress for the year 1857", p. 92. Toronto, 1858.

Black, with geological indications.

## 171.

**1857—Richardson (J.).** Plan showing the distribution of the Laurentian and Lower Silurian rocks in the vicinity of Lake St. John.

Accompanying "Geol. Surv. Canada; report of progress for the year 1857", p. 92. Toronto, 1858.

Black, with geological indications.

## 172.

**1858—Logan (Sir W. E.).** Plan showing the distribution of crystalline limestone of the Laurentian series in the counties of Argenteuil and Ottawa.

Accompanying "Geol. Surv. of Canada; report of progress for the year 1858", p. 66. Montreal, 1859.

Black, with geological indications.

173.

- 1858—Logan (Sir W. E.).** Plan showing the distribution of the Huronian rocks, between rivers St. Mary and Missisague.

Accompanying "Geol. Surv. Canada; report of progress for the year 1858", p. 104. Montreal, 1859.

Black, with geological indications.

174.

- 1858—Richardson (J.).** Plan showing the distribution of the Devonian and Silurian formations in a part of Gaspé.

Accompanying "Geol. Surv. of Canada; report of progress for the year 1858", p. 170. Montreal, 1859.

Black, with geological indications.

175.

- 1860—Gibb (G. D.).** Murray's cavern and subterranean river—Fourth chute of the Bonne Chère River, Ottawa.

Accompanying "On Canadian Caverns;" The Geologist, edited by J. S. Mackie, Vol. III, pl. XI. London, 1860.

Colored, and with geological indications.

176.

- 1860—Gibb (G. D.).** Basaltic dykes of Mecattina.

Accompanying "On Canadian Caverns;" The Geologist, edited by J. S. Mackie, Vol. III, pl. VIII. London, 1860.

Colored, and with geological indications.

177.

- 1860—Gibb (G. D.).** The basaltic caverns of Henley Island.

Accompanying "On Canadian Caverns;" The Geologist, edited by J. S. Mackie, Vol. III, pl. VII. London, 1860.

178.

- 1860—Gibb (G. D.).** Caverns and arched rocks at Percé Gaspé.

Accompanying "On Canadian Caverns;" The Geologist, edited by J. S. Mackie, Vol. III, pl. VI. London, 1860.

Colored, and with geological indications.

179.

- 1862—Logan (Sir W. E.).** Map showing the distribution of Laurentian rocks in parts of the counties of Ottawa, Terrebonne, Argenteuil, and Two Mountains. Scale, 7 miles to 1 inch.

Accompanying "Geol. Surv. Canada; report of progress from its commencement to 1863." Atlas of maps and sections, with an introduction and appendix. Geological maps II. Montreal, 1865.

(49)

180.

**1862—Logan (Sir W. E.).** Plan showing the distribution of limestone conglomerates in the Quebec group, of Point Lévis.

Accompanying "Geol. Surv. Canada; report of progress from its commencement to 1863." Atlas of maps and sections, with an introduction and appendix. Geological maps V. Montreal, 1865.

Black etching.

See Logan (Sir W. E.), 1862—No. 181.

181.

**1862.—Logan (Sir W. E.).** Plan showing the distribution of limestone conglomerates in the Quebec group at Point Lévis.

Accompanying "Letter addressed to Mr. Joachim Barrande, on the rocks of the Quebec group at Point Lévis," in *The Canadian Naturalist and Geologist*, May and June, 1863. Vol. VIII, p. 183. Montreal, June, 1863.

Black etching.

182.

**1863—Marcou (Jules).** Plan des gisements des lentilles dolomitiques dans les schistes Taconiques de la Pointe Lévis, au Canada, 1861-1863.

Accompanying "Notice sur les gisements des lentilles trilobitifères taconiques de la Pointe Lévis, au Canada." *Bull. Soc. géol. France*, 2<sup>e</sup> série, Vol. XXI, p. 236. Paris, 1864.

Black etching.

183.

**1865—Logan (Sir W. E.).** Map showing the distribution of various superficial deposits between Lake Superior and Gaspé. Scale, 125 miles to the inch.

Accompanying "Geol. Surv. Canada; report of progress from its commencement to 1863." Atlas of maps and sections, with an introduction and appendix. Geological maps VI. Montreal, 1865.

184.

**1865—Logan (Sir W. E.).** Map showing the distribution of the Huronian rocks between rivers Bachechwahnung and Mississagui. Scale, 1,506,880, or 8 miles to the inch.

Accompanying "Geol. Surv. Canada; report of progress from its commencement to 1863." Atlas of maps and sections, with an introduction and appendix. Geological maps III. Montreal, 1865.

185.

**1865—Logan (Sir W. E.).** Map showing the distribution of rocks belonging to the Potsdam, Quebec, and Trenton groups, on the east side of Lake Champlain, in the neighbourhood of the line between Canada East and Vermont. Scale, two miles to an inch.

Accompanying "Geol. Surv. Canada; report of progress from its commencement to 1863." Atlas of maps and sections, with an introduction and appendix. Geological maps IV. Montreal, 1865.

(50)

186.

- 1868—Richardson (James).** Map showing the distribution of the Lower Silurian rocks between the Chaudière and Trois Pistoles Rivers, south side of the river St. Lawrence, province of Quebec. Scale, eight miles to one inch.

Accompanying "Geol. Surv. Canada; report of progress from 1866 to 1869", p. 119. Montreal, 1870.

187.

- 1868—Vennor (H. G.).** Map showing the distribution of the rock formations in parts of the counties of Peterborough, Hastings, Addington, and Frontenac, province of Ontario. Scale, 4 miles to one inch.

Accompanying "Geol. Surv. Canada; report of progress from 1866 to 1869", p. 143. Montreal, 1870.

188.

- 1874—Vennor (H. G.).** Plan of a portion of North Burgess, shewing position of apatite openings. Scale, half a mile to an inch.

Accompanying "Report of explorations and surveys in Fontenac, Leeds, and Lanark Counties," Geol. Surv., Canada; report of progress for 1873-74, p. 128. Montreal, 1874.

Black etching, and geological indications.

189.

- 1876—Vennor (H. G.).** Map of Lanark County and parts of Renfrew and Leeds, province of Ontario. Geologically shaded. Scale, 4 miles to one inch.

Accompanying "Report of explorations in the rear portions of Frontenac and Lanark Counties, etc." Geol. Surv. of Canada; report of progress for 1874-75, p. 105. Montreal, 1876.

190.

- 1877—Vennor (H. G.).** Map of Ottawa County. Scale, 4 miles to one inch.

Accompanying "Report of Ottawa County." Geol. Surv. of Canada; report of progress for 1876-77, p. 320. Montreal, 1878.

191.

- 1880—Dawson (J. W.).** Western Canada.

Accompanying "Lecture notes on geology and outline of the geology of Canada." Montreal, 1880.

Black etching.

192.

- 1880—Dawson (J. W.).** Eastern Canada.

Accompanying "Lecture notes on geology and outline of the geology of Canada." Montreal, 1880.

Black etching.

(51)

**VII.—NEW ENGLAND, COMPRISING MAINE, NEW HAMPSHIRE,  
VERMONT, MASSACHUSETTS, RHODE ISLAND, AND CON-  
NECTICUT.**

193.

- 1817—Hitchcock (E.).** A geological map of a part of Massachusetts on Connecticut River.

Accompanying "Remarks on the geology and mineralogy of a section of Massachusetts on Connecticut River, with a part of New Hampshire and Vermont." Amer. Journ., Silliman. Vol. I. New York, 1819.

194.

- 1818.—Dana (J. F.) and Dana (S. L.)** A geological map of Boston and its vicinity.

Accompanying "Outlines of the mineralogy and geology of Boston and its vicinity," with a geological map. Boston, 1818.

195.

- 1819—Dewey (C.).** A geological map of the northwest part of Massachusetts. Scale, 2 miles to the inch.

Accompanying "Sketch of the mineralogy and geology of the vicinity of Williams College, Williamstown, Mass." Amer. Journ., Silliman. Vol. I. New York, 1819.

196.

- 1822—Hitchcock (E.).** A geological map of the Connecticut. Scale, 5 miles to  $\frac{3}{4}$  of an inch.

Accompanying "A sketch of the geology, &c. of the regions contiguous to the river Connecticut." Amer. Journ., Silliman. Vol. VI. New Haven, 1823.

197.

- 1824—Dewey (C.).** A geological map of the county of Berkshire, Mass., and of a small part of the adjoining States.

Accompanying "A sketch of the geology and mineralogy of the western part of Massachusetts and a small part of the adjoining States." Amer. Journ. Silliman. Vol. VIII. New Haven, 1824.

198.

- 1824—Hitchcock (E.)** Outlines of the geology of Martha's Vineyard, &c.

Accompanying "Notices of the geology of Martha's Vineyard and the Elizabeth Islands." Amer. Journ. Silliman. Vol. VII, p. 336, Plate IV. New Haven, 1824.

Reprinted in Journal of Science of the Royal Institution of London, February, 1824.

199.

- 1827—Nash (A.).** Geology of the lead mines and veins of Hampshire County, Massachusetts. Scale, 3 miles to an inch.

Accompanying "Notices of the lead mines and veins of Hampshire County, Massachusetts, and of the geology and mineralogy of that region." Amer. Jour. Silliman. Vol. XII, p. 270. New Haven, 1827.

200.

- 1832—Hitchcock (E.).** A geological map of Massachusetts. Scale, 5 miles to three-quarters of an inch.

Accompanying "Report on the geology of Massachusetts under the direction of the government of that State." Amer. Jour. Silliman. Vol. XXII. New Haven, 1833.

Is also published separately.

201.

- 1833—Hitchcock (E.).** A geological map of Massachusetts.

Accompanying "Report on the geology, mineralogy, &c., of Massachusetts, with an atlas in 4° of plates." Plate I. Amherst, 1853.

202.

- 1837—Hitchcock (E.).** Geology of Portland and its vicinity.

Accompanying "Sketch of the geology of Portland and its vicinity," in Boston Journal of Natural History, Vol. I, p. 360. Boston, 1837.

The copy seen of this map has not been colored; there are merely a few black etchings on it.

203.

- 1840—Jackson (C. T.).** A geological map of Rhode Island. Scale, 3 miles to an inch.

Accompanying "Report on the geological and agricultural survey of the State of Rhode Island." Providence, 1840.

204.

- 1841—Hitchcock (E.).** A geological map of Massachusetts. Fourth edition.

Accompanying "Final report on the geology of Massachusetts," Vol. I, Plate 52. Frontispiece. 4°. Northampton, 1841.

The author calls it an "Index to a Geological Map of the State"; and adds: "Whenever the large map shall be completed, and the government wish, I shall be ready to color it geologically." The larger map was published in 1844, under the title, "Geological map of Massachusetts, made by order of the legislature." Scale, 5 miles to an inch, 1:316,800. It is placed at the left hand lower corner of the large topographical map published by the legislature. Boston, 1844.

205.

- 1842—Percival (J. G.).** A geological map of Connecticut.

Accompanying "Report on the geology of the State of Connecticut." New Haven, 1842.

Black, with the outlines of the formations and letters.

(53)



206.

- 1844—Hitchcock (E.). Geological map of Massachusetts made by order of the legislature. Scale, 5 miles to an inch, or 1:316,800. Boston, 1844.

It is placed at the left hand lower corner of the large topographical map published by the legislature.

See Hitchcock (Edward), 1841—No. 204.

207.

- 1844—Jackson (C. T.). A geological map of New Hampshire. Scale, 6 miles to the inch.

Accompanying "Final report on the geology and mineralogy of the State of New Hampshire." 4°. Concord, 1844.

Black, with conventional signs only.

208.

- 1845—Jackson (C. T.). A geological map of New Hampshire. Scale, 6 miles to the inch.

Accompanying "Views and map illustrating the scenery and geology of the State of New Hampshire.\*" Boston, 1845.

See Jackson (C. T.), 1844, same map—No. 207.

209.

- 1853—Hitchcock (E.). (Geological map.) Bristol and Rhode Island coal field.

Accompanying "Report on certain points in the geology of Massachusetts." House (Document) No. 39, p. 4. Boston, 1853.

No place or date of publication on the map. It is the first geological map printed mechanically in colors in America, by A. Sonrel, of Woburn, Massachusetts.

210.

- 1857—Hitchcock (E.). Ichno-geological map of the Connecticut Valley.

Accompanying "A report on the sandstone of the Connecticut Valley, especially its fossil foot-marks." 4°. Plate II. Boston, 1858.

211.

- 1857—Hitchcock (E.). Ichno-geological map of the Connecticut Valley (portion in Massachusetts).

Accompanying "Some indications of recent sensitiveness to unequal pressures in the earth's crust." By H. F. Walling. Proceedings of American Association for the advancement of science. Vol. XXVII, p. 192. Salem, 1879.

212.

- 1860—Hager (A. D.). Geological map of Plymouth, Vermont.

Accompanying "Report on the geology of Vermont," in two vols., 4°, Vol. II, Plate XVIII. Claremont, N. H., 1861.

(54)

213.

- 1860—Anonymous** (Hitchcock, C. H.). Road map of the island of Rhode Island or Aquidneck. Scale, 1 inch to the mile. Newport, (R. I.), 1860.

Presented by the city of Newport to the members of the American Association for the Advancement of Science August 1, 1860. Colored geologically.

214.

- 1861—Hager** (A. D.). Geological map of the State of Vermont.

Accompanying "Map of the State of Vermont under the direction of H. F. Walling," in four sheets. A small map in the corner of the title sheet. New York, 1861.

215.

- 1861—Hitchcock** (father and sons). Geological map of a part of Rutland County and Isle la Motte, Vermont.

Accompanying "Report on the Geology of Vermont," in two volumes, 4to, Vol. II, Plate VIII. Claremont, N. H., 1861.

216.

- 1861—Hitchcock** (father and sons). Geological map of Vermont, traced out and compiled by the members of the geological survey, Messrs. Edward Hitchcock, Edward Hitchcock, jr., Charles H. Hitchcock, and Albert D. Hager. Scale, 1 : 400,000.

Accompanying "Report on the geology of Vermont," in two volumes, 4to, Vol. II. Claremont, N. H., 1861.

217.

- 1861—Hitchcock** (C. H.). Map of the surface geology of Vermont. Scale, 1 : 400,000.

Accompanying "Report on the geology of Vermont," in two volumes, 4to, Vol. II. Claremont, N. H., 1861.

218.

- 1862—Hitchcock** (C. H.). Geological map of Northern Maine.

Accompanying "Notes on the geology of Maine," in Proceed. of the Portland Society of Nat. Hist., Vol. I, Part I., p. 84. Portland, 1862.

Black etching and geological indications.

See **Hitchcock** (C. H.), 1862—No. 219.

219.

- 1862—Hitchcock** (C. H.). Geological map of Northern Maine.

Accompanying "General report upon the geology of Maine," sixth annual report of the secretary of the Maine Board of Agriculture, p. 318. Augusta, 1861.

Black etching and geological indications. The report is dated 1861 and the map 1862.

(55)

220.

- 1863—Hitchcock (C. H.).** (No title on the map.) Geological map of the country between Belfast and Saint George, west side of Penobscot Bay, Maine.

Accompanying "Second annual report upon the Nat. Hist. and Geology of the State of Maine," Part II, p. 227. (Boston) 1863.

Black etching and colors. No name of place of publication, but the small map was lithographed in Boston.

221.

- 1863—Hitchcock (C. H.).** Geology of Rockport and vicinity.

Accompanying "Second annual report upon the Nat. Hist. and Geology of the State of Maine," p. 242. (Boston) 1863.

Black etching.

222.

- 1869—Hitchcock (C. H.).** Geological map of part of the Ammonoosuc gold field, New Hampshire.

Accompanying "First annual report upon the geology and mineralogy of the State of New Hampshire." Manchester, 1869.

223.

- 1870—Hitchcock (C. H.).** Map illustrating the distribution of granite in New Hampshire.

Accompanying "Second annual report upon the geology and mineralogy of the State of New Hampshire." Manchester, 1870.

224.

- 1871—Hitchcock (C. H.).** Geological map of Massachusetts. Scale, 10 miles to an inch.

Accompanying "Official Topographical atlas of Massachusetts," by H. F. Walling and O. W. Gray. Folio, p. 18. Boston, 1871.

225.

- 1872—Hitchcock (C. H.).** (No title.) Geological map of the White Mountains.

Accompanying "Report of the geological survey of the State of New Hampshire," showing its progress during the year 1871. Nashua, 1872.

226.

- 1874—Marcon (Jules).** Carte géologique des bords du Lac Champlain entre Georgia (Vermont), Chazy (New York), et Phillipsburgh (Canada).

Accompanying "Sur les colonies dans les roches Taconiques des bords du Lac Champlain," Bull. Soc. Géol. France," 3ième série, Vol. IX, p. 18. Paris, 1880.

Scale, 1:160,000, is not given on the map, owing to a mistake of the engravers.

227.

- 1877—Crosby (W. O.).** Geological map of Eastern Massachusetts and of Boston and vicinity. Scale, 1 mile to the inch for Boston and 5 miles to 1 inch for Eastern Massachusetts.

Accompanying "Contributions to the geology of Eastern Massachusetts." Occasional papers of the Boston Society of Natural History, III. Boston, 1880.

These two maps are on the same large sheet. The smaller one (Eastern Massachusetts) occupying the right-hand lower corner.

228.

- 1877—Hitchcock (C. H.).** Geological map of New Hampshire and Vermont.

Accompanying "A topographical atlas of New Hampshire," by Walling. (New York,) 1877.

229.

- 1877—Hitchcock (C. H.).** Geological map illustrating the relation of the New Hampshire formations to those of the adjacent territory.

Accompanying "The geology of New Hampshire, Vol. 11, p. 8. Plate I. Concord, 1877.

Black etching.

230.

- 1878—Hitchcock (C. H.).** (No title.) Map of the Ammonoosuc mining district.

Accompanying the "Report on the geology of New Hampshire." Folio atlas. New York, 1878.

On the map itself no name of author, no date, and no place of publication are inscribed.

331.

- 1878—Hitchcock (C. H.).** (No title.) General geological map of New Hampshire, embracing portions of Maine, Vermont, and Quebec. Scale,  $2\frac{1}{2}$  miles to the inch.

Accompanying the "Report on the geology of New Hampshire." Folio atlas. New York, 1878.

Six sheets. No title, no date, nor scale are inscribed on the map. The explanation is to be found in Vol. II, p. 672, of "Geology of New Hampshire."

232.

- 1881—Hawes (G. W.).** Map of the Mount Willard region. Scale,  $2\frac{1}{2}$  miles to 1 inch.

Accompanying "The Albany granite, New Hampshire, and its contact phenomena," Amer. Journ. Silliman. 3d series, Vol. XXI, p. 22. New Haven, 1881.

Black etching.

(57)

**VIII.—NEW YORK AND NEW JERSEY.**

233.

**1822—Barton (D. W.).** Barton on the Catskills.

Accompanying "Notice of the geology of the Catskills." *Amer. Journ. Silliman*. Vol. IV, p. 250. New Haven, 1822.

Black etching and geological indications.

234.

**1830—Eaton (Amos).** This colour'd map exhibits a general view of the economical geology of New York and part of the adjoining States.

Accompanying "Geological text-book prepared for popular lectures on North American geology with applications to agriculture and the arts." Albany, 1830.

This is the first attempt at a geological map of the State of New York.

235.

**1831—Young (J. B.) and Heron (J.).** Geological mineralogical map of a part of Orange County, New York. Scale, 2 miles to the inch.

Accompanying "Mineralogy and geology of the counties of Orange (N. Y.), and Sussex (N. J.), by Charles U. Shepard. *Amer. Journ. Silliman*. Vol. XXI, p. 321. New Haven, 1832.

Black etching.

236.

**1839—Rogers (H. D.).** A geological map of New Jersey. Scale, 6 miles to one inch.

Accompanying "Description of the geology of the State of New Jersey, being a final report." Philadelphia, 1840.

237.

**1842—Emmons (E.).** Map of the county of Jefferson.

Accompanying "Geology of New York," Part II, comprising the survey of the second geological district. Plate XVI. 4°. Albany, 1842.

238.

**1842—Emmons (E.).** Geological map of Clinton County.

Accompanying "Geology of New York," Part II, comprising the survey of the second geological district. Plate XVII. 4°. Albany, 1842.

(58)

## 239.

**1842—New York.** Geological map of the State of New York.

Accompanying "Geology of New York," by Emmons, Hall, Mather, and Vanuxem. Four vols. 4°. New York, 1842.

Each volume giving a notice of a geological district comprised in the general map also due to the same four authors.

This map is very important, and marks a second starting point in American geology. It gives a good classification of the American paleozoic rocks due mainly to the researches of Ebenezer Emmons and Vanuxem. But a discrepancy exists between the map and the volumes of explanation which show a want of harmony and a great difference of views between the geologists who had charge of the publication. In the volume Part IV we find in the "Tabular view of the sedimentary rocks of New York," and in the "Plan of arrangement in the State geological collection," the Taconic system, spelled also Taghconick; but no trace of it exists on the geological map. Emmons being the author of the main part of the classification, and being convinced that a system of strata older than the Potsdam sandstone existed, maintained his view in the first volume of the "Agriculture of New York," where he describes "the Taconic system." And in order to show the geographical distribution and position of these rocks, he prepared a geological map of the State of New York (see "Agriculture," part V, p. 361), a reprint, as he says, in the main of the map which accompanies the first reports (i. e., the map published by legislative authority referred to here). Important additions, however, were made to it. Parts of Vermont, Massachusetts, and Connecticut, were included; in addition to this, the Taconic system was marked out and colored and made a distinct part of the map; it occupies a belt extending from the Canadian line to New Jersey and Tappan Bay on the Hudson River below the Highlands. "The three thousand copies of this modified map of the State, showing the extent of the Taconic in New York, were stolen or destroyed by persons unknown, so that they were never issued with the proper volume." (Extract from a letter of E. Emmons to J. Marcou, dated Raleigh, N. C., December 28, 1860.)

## 240.

**1842—Mather (W. W.).** Geological map of Long and Staten Islands, with the environs of New York.

Accompanying "Geology of New York." Part I comprising the geology of the first geological district. Plate I. 4°. Albany, 1843.

## 241.

**1843—Cozzens (S.).** A geological map of New York or Manhattan Island.

Accompanying "A geological history of Manhattan or New York Island." Plate I, p. 10. New York, 1843.

## 242.

**1845—Lyell (Sir Charles).** Birds-eye view of the falls of Niagara and adjacent country, coloured geologically.

Accompanying "Travels in North America in the years 1841–42." 2 vols. Frontispiece of Vol. I. London and New York, 1845.

A panoramic geological map of the country between Lake Erie and the towns of Lewiston and Queenstown.

243.

- 1846—Lyell (Sir Charles).** Birds-eye view of the falls of Niagara and adjacent country, coloured geologically.

Accompanying "Reisen in Nord-Amerika von Charles Lyell." German edition. Halle, 1846.

See **Lyell (Sir Charles)**, 1845—No. 242.

244.

- 1855—Lyell (Sir Charles).** Birds-eye view of the falls of Niagara and adjacent country, coloured geologically.

Accompanying "Travels in North America in the years 1841–42." 2 vols. Frontispiece of Vol I. 2d edition. London, 1855.

See **Lyell (Sir Charles)**, 1845—242.

245.

- 1865—Credner (H.).** Geologische Skizze von New York.

Accompanying "Geognostische Skizze der Umgegend von New York." Zeitsch. Deut. Geol. Gesells. Vol. XVII, Taf. XIII. Berlin, 1865.

246.

- 1865—Cook (G. H.).** Geological map of New Jersey.

Accompanying "Annual report of the geological survey of New Jersey for 1864." Trenton, 1865.

247.

- 1866—Cook (G. H.) and Smock (J. C.).** Geological survey of New Jersey. Cretaceous formations: including the green-sand marl beds. Scale, 2 miles to an inch.

Accompanying "Geology of New Jersey," by authority of the legislature; with a 4to atlas. Map, No. 3. Newark, 1868.

In two sheets.

248.

- 1867—Cook (G. H.) and Smock (J. C.).** Geological survey of New Jersey. Map of Oxford furnace iron-ore veins. Scale, 8 inches per mile.

Accompanying "Geology of New Jersey," by authority of the legislature; with a 4to atlas. Map No. 7. Newark, 1868.

249.

- 1867—Cook (G. H.) and Smock (J. C.).** Geological survey of New Jersey. Map of zinc mines, Sussex County. Scale, 8 inches per mile.

Accompanying "Geology of New Jersey," by authority of the legislature; with a 4to atlas. Map No. 8. Newark, 1868.

No explanation of the coloring on the map; there are mineralogical indications on the sections.

(60)

250.

- 1867—Cook (G. H.) and Smock (J. C.).** Geological survey of New Jersey. Triassic formation, including the red sandstone and trap rocks of Central New Jersey. Scale, 2 miles to an inch.

Accompanying "Geology of New Jersey," by authority of the legislature; with a 4to atlas. Map No. 2. Newark, 1868.

In two sheets.

251.

- 1867—Cook (G. H.) and Smock (J. C.).** Geological survey of New Jersey. Tertiary and recent formations of Southern New Jersey.

Accompanying "Geology of New Jersey," by authority of the legislature; with a 4to atlas. Map No. 4. Newark, 1868.

In two sheets; no scale is given, but it is evidently that of 2 miles to the inch.

252.

- 1868—Cook (G. H.).** No title. (A geological map of New Jersey.) Scale, 20 miles to an inch.

Accompanying "Geology of New Jersey," by authority of the legislature; p. 39 of the introduction. Newark, 1868.

Black etching.

253.

- 1868—Cook (G. H.) and Smock (J. C.).** Geological survey of New Jersey. Azoic and paleozoic formations, including the iron-ore and limestone districts. Scale, 2 miles to an inch.

Accompanying "Geology of New Jersey," by authority of the legislature; with a 4to atlas. Map No. 1. Newark, 1868.

In two sheets.

254.

- 1870—Credner (H.).** Geognostische Skisse von New Jersey nach Rogers, Cook, and Smock.

Accompanying "Die Kreide von New Jersey." Zeitsch. Deut. Geol. Gesells. Vol. XXII, Taf. IV. Berlin, 1870.

Black etching and geological indications.

255.

- 1880—Cook (G. H.).** Lake Passaic (a glacial lake). Scale, 6 miles to the inch.

Accompanying "Annual report of the State geologist for the year 1880." Trenton, 1880.

256.

- 1880—Cook (G. H.) and Smock (J. C.).** The State of New Jersey. Economic geology. Scale, 6 miles to the inch.

Accompanying "Annual report of the State geologist for the year 1879." Trenton, 1879.

(61)



257.

**1880—Dana (J. D.). Part of Western Cortlandt.**

Accompanying "Geological relations of the limestone belts of Westchester County, New York." Amer. Journ. Silliman, 3d series, Vol. XX, p. 195. New Haven, 1880.

Black etching.

258.

**1880—Dana (J. D.). Limestone areas of Westchester County. Scale, 3 miles to the inch.**

Accompanying "Geological relations of the limestone belts of Westchester County, New York." Amer. Journ. Silliman, 3d series, Vol. XX, Plate V. New Haven, 1880.

In one color and black etching.

259.

**1880—Dana (J. D.). Geological map of part of New York and New Jersey, from Prof. G. H. Cook's map of New Jersey. Scale, 10 miles to the inch.**

Accompanying "Geological relations of the limestone belts of Westchester County, New York." Amer. Journ. Silliman, 3d series, Vol. XX, Plate IX. New Haven, 1880.

Black etching.

260.

**1880—Dana (J. D.). Limestone areas of Dutchess, Westchester, and Putnam Counties, New York, and of part of Western Connecticut, with the Archæan of Putnam County, and the Palisade Trap range. Scale, 10 miles to the inch.**

Accompanying "Geological relations of the limestone belts of Westchester County, New York." Amer. Journ. Silliman, 3d series, Vol. XX, Plate VIII. New Haven, 1880.

Black etching.

261.

**1881—Abbott (C. C.). Map of area of Trenton gravel in vicinity of Trenton, N. J.**

Accompanying "Primitive industry; or illustrations of the handiwork in stone, bone, and clay of the native races of the Northern Atlantic seaboard of America." p. 531. Salem, 1881.

262.

**1881—Britton (N. L.). A geological map of Richmond County, New York. Scale, 1:120,000.**

Accompanying "On the geology of Richmond County, New York." Ann. New York Acad. Sci., Vol. II. Plate XV, p. 161. New York, 1881.

263.

**1881—Cook (G. H.) and Smock (J. C.). Geological map of New Jersey. Scale, 6 miles to 1 inch.**

Accompanying "Geological Survey of New Jersey." Annual report of the State Geologist for the year 1881. Trenton, 1881.

A well-executed and clear geological map.

(62)

264.

- 1881—Dana (J. D.).** Geological map of southern Westchester County and northern New York island. Scale, 2 inches to 1 mile.

Accompanying "Geological relations of the limestone belts of Westchester County, New York." Amer. Journ. Silliman, 3d series, Vol. XXI, Plate XIX. New Haven, 1881.

In one color, and geological indications.

265.

- 1881—Dana (J. D.).** Part of Western Cortlandt.

Accompanying "On a case in which various massive crystalline rocks, including soda-granite, quartz-diorite, norite, hornblendite, pyroxenite, and different chrysolitic rocks, were made through metamorphic agencies in one metamorphic process. The Geological Magazine, 2d series, Vol. VIII, p. 60. London, 1881.

Black etching.

266.

- 1881—Dana (J. D.).** Stony Point.

Accompanying "Geological relations of the limestone belts of Westchester County, New York. Origin of the rocks of the Cortlandt series." Amer. Journ. Silliman, 3d series, Vol. XXII, p. 112. New Haven, 1881.

Black, with geological indications.

267.

- 1881—Dana (J. D.).** Map of parts of New York and New Jersey. Scale, 10 miles to 1 inch.

Accompanying "Geological relations of the limestone belts of Westchester County, New York. Origin of the rocks of the Cortlandt series." Amer. Journ. Silliman, 3d series, Vol. XXII, p. 106. New Haven, 1881.

Black etching.

268.

- 1881—Dana (J. D.).** Map of part of western Cortlandt, showing the Peekskill, Verplanck, Tompkins, Cove, and Cruger limestone areas, by horizontal lining. Scale, 1 inch to a mile.

Accompanying "Geological relations of the limestone belts of Westchester County, New York. Origin of the rocks of the Cortlandt series." Amer. Journ. Silliman, 3d series, Vol. XXII, p. 107. New Haven, 1881.

Black etching.

All these small maps by Mr. J. D. Dana are sketch-maps with geological indications.

(63)

**IX.—PENNSYLVANIA, DELAWARE, AND MARYLAND.**

269.

**1822—Cist (Z.).** Range of the anthracite formation of Pennsylvania.

Accompanying "Account of the mines of anthracite in the region about Wilkesbarre, Pennsylvania." Amer. Journ. Silliman, Vol. IV, p. 14. New Haven, 1822.

Black etching.

270.

**1824—Finch (J.).** Geology of Easton, &c.

Accompanying "A sketch of the geology of the country near Easton, Pennsylvania." Amer. Journ. Silliman, Vol. VIII. New Haven, 1824.

271.

**1826—Troost (Gerard).** Karte der Gegend von Philadelphia.

Accompanying "Geological survey of the environs of Philadelphia," cited by B. Cotta, in his "Geognostische Karten unseres Jahrhunderts's," 1850, p. 48, No. 533. This map is unknown even in Philadelphia, and contemporaries of Troost, such as the late T. Conrad and Mr. Isaac Lea, had never heard of such a map. It is very doubtful if it exists.

272.

**1834—Taylor (R. C.).** Rough sketch of the position of the transition beds near Lewiston, Mifflin County, Pennsylvania, containing various species of fossil Fucoides. Scale, 1 inch to 1 mile.

Accompanying "On the geological position of certain beds which contain numerous fossil marine plants of the family Fucoides, near Lewiston, Mifflin County, Pennsylvania," in Transactions of the Geological Society of Pennsylvania, Vol. I, Part I, Plate IV. Philadelphia, 1834.

273.

**1835—Koebler (H.).** Petrographical map of the coal region of Tamaqua.

Accompanying "On the anthracite deposit at Tamaqua, Schuylkill County, Pennsylvania." Transactions of the Geological Society of Pennsylvania, Vol. I, Part II, p. 326. Philadelphia, 1835.

Black etching and geological indications.

274.

**1835—Taylor (R. C.).** Map of Kishacoquillas Valley. Scale, 5 miles to an inch.

Accompanying "Notice as to the evidences of the existence of an ancient lake, which appears to have formerly filled the limestone valley of Kishacoquillas, in Mifflin County, Pennsylvania." Transactions of the Geological Society of Pennsylvania, Vol. I, Part II, p. 198. Philadelphia, 1835.

(64)

275.

- 1848—Taylor (R. C.).** Map of the group of anthracite basins in Pennsylvania.

Accompanying "Statistics of coal," p. 112. Philadelphia, 1848.

276.

- 1848—Taylor (R. C.).** Map illustrative of the statistics of the coal trade of Pennsylvania. Showing the relative positions of the various anthracite and bituminous coal fields.

Accompanying "Statistics of coal," p. 144. Philadelphia, 1848.

277.

- 1857—Dalson (A. F.).** Geological map of the Howard Hill coal field. Scale, 1 mile to 1 inch.

Accompanying "2d Geol. Surv. Pennsylvania. The geology of McKean County," by Chas. A. Ashburner. Vol. R, p. 168. Harrisburg, 1880.

278.

- 1857—Rogers (H. D.).** Map of the anthracite and bituminous coal fields of Pennsylvania.

Accompanying "The geology of Pennsylvania." 4°. Vol. II, p. 1019. Edinburg, 1858.

Black etching.

279.

- 1858—Rogers (H. D.).** Map of the mining district of Chester and Montgomery Counties.

Accompanying "The geology of Pennsylvania." 4°. Vol. II, Part III, p. 674. Edinburg, 1858.

280.

- 1858—Rogers (H. D.).** Map of the Cornwall ore hills, Lebanon County.

Accompanying "The geology of Pennsylvania." 4°. Vol. II, Part IV, p. 719. Edinburg, 1858.

Black etching with geological indications.

281.

- 1858—Rogers (H. D.).** Geological and topographical map of the anthracite fields of Pennsylvania. Scale, 2 miles to the inch.

Accompanying "The final report on the geological survey of the State 1858." 4°. Atlas. Edinburg, 1858.

In two sheets.

282.

- 1858—Rogers (H. D.).** Geological map of the State of Pennsylvania, constructed from original surveys made between the years 1836 and 1857. Scale, 5 miles to the inch.

Accompanying "The final report on the geological survey of the State, 1858." 4°. Atlas. Edinburg, 1858.

In three sheets.

(65)

283.

- 1859—Tyson (P. T.).** Geological illustrations (preliminary geological map of Maryland).

Accompanying "First report of Philip T. Tyson, State agricultural chemist, to the house of delegates of Maryland." Annapolis, 1860.

284.

- 1864—Green (W., jr.).** Map of the Lackawanna coal field, Luzerne County, Pennsylvania.

Accompanying "Notes on the anthracite coal region of North America." Trans. North of England Inst. Mining Engrs. Vol. XIII, p. 25. Newcastle-upon-Tyne, 1864.

285.

- 1864—Lesley (J. P.).** (No title.)

Accompanying "On the discovery of lignite in Pennsylvania." Proc. Amer. Phil. Soc., Vol. IX, Plate XI. Philadelphia, 1865.

Colored and with geological indications.

286.

- 1871—Lesley (J. P.).** A map showing the topographical character of the southern part of the lands of the Pittsburgh and Baltimore coal, coke, and iron company, Ursina, in Somerset County, Pennsylvania. Scale of 1 mile (to the inch?)

Accompanying "Note on an apparent violation of the law of regular progressive debituminization of the American coal beds coming East." Proc. Amer. Phil. Soc., Vol. XII, p. 131. Philadelphia, 1873.

Black, with indications of limestone and ferriferous coal bed banks written on it.

287.

- 1871—Platt (Franklin, jr.).** Map of the Pittsburgh and Baltimore coal, coke, and iron company's lands, Ursina, Somerset County, Pennsylvania. Scale, 1,500 feet to an inch.

Accompanying "Note on an apparent violation of the law of regular progressive debituminization of the American coal beds coming East." Proc. Amer. Phil. Soc., Vol. XII, p. 160. Philadelphia, 1873.

A topographical map, with lithological and mineralogical indications written on the map.

288.

- 1871—Lesley (J. P.).** A map showing the areas occupied by the 6 foot coal bed in the hills north of Ursina. Scale, 1 mile to the inch.

Accompanying "Note on apparent violation of the law of regular progressive debituminization of the American coal beds coming East." Proc. Amer. Phil. Soc., Vol. XII, p. 129. Philadelphia, 1873.

Black etching.

(66)

289.

- 1872—Lesley (J. P.).** (No title.) Scale, 1 inch to 1 mile.

Accompanying "Saint Clairsville and Bedford Railroad, and Dunning's Creek fossil iron ore." Proc. Amer. Phil. Soc., Vol. XIII, p. 256. Philadelphia, 1873.

In one color and geological indications.

290.

- 1872—Smith (S.).** Topographical map of Gaines Coal Basin, in Gaines Township, Tioga County. Contour curves, 100 feet apart. Scale, 2,000 feet to the inch.

Accompanying "2d Geol. Surv. Pennsylvania." Report of progress, vol. G. G. G., by Andrew Sherwood. Harrisburg, 1880.

Black etching.

291.

- 1872—Strauch and Cochran.** Map of the first and second anthracite coal fields of Pennsylvania.

Accompanying "Coal regions of America," by James Macfarlane. p. 17. New York, 1873.

Black etching.

292.

- 1873—Lesley (J. P.).** Topographical map of Pennsylvania, colored for the principal geological formations.

Accompanying "Coal regions of America," by James Macfarlane. New York, 1873.

293.

- 1873—Lesley (J. P.).** A study, in ten-foot contour-lines, of the structure and erosion of Brush Mountain, showing the outcrops of the two upper silurian fossil iron ore beds passing Tyrone Gap, Blair County, Pennsylvania.

Accompanying "A study of the structure and erosion of Brush Mountain." Proc. Amer. Phil. Soc., Vol. XIII. Philadelphia, 1873.

Black, with geological indications.

294.

- 1874—Clark (E., jr.).** A map in ten-foot contour lines, showing the ranges of brown hematite ore banks in a portion of Lehigh County. Scale, 3,200 feet to the inch.

Accompanying "2d Geol. Surv. Pennsylvania. Brown hematite ore ranges of Lehigh County," by Frederick Prime, jr. Vol. D. Harrisburg, 1875.

Black etching, with geological indications. See note by State geologist, page 67.

295.

- 1874—Frazer (P., jr.) and Lehman (A. E.).** A map of the central belt of brown hematite ore mines in York and Adams Counties. Scale, 1 mile to the inch.

Accompanying "2d Geol. Surv. Pennsylvania. Report of progress in York and Adams Counties," by Persifer Frazer. Vol. C, p. 196. Harrisburg, 1876.

(67)

296.

- 1874—Lesley (J. P.) and Platt (F.).** A study, in twenty-foot contour lines, of the structure and erosion of a part of the lower silurian iron ore region northeast of the Little Juniata River, in Huntingdon and Centre Counties, Pennsylvania. Scale, before reduction by photograph, 3.325 inches to 1 mile.

Accompanying "The brown hematite ore banks of Spruce Creek, Warrior's Mark Run, and Half Moon Run, in Huntingdon and Centre Counties, Pennsylvania, along the line of the Lewisburg, Centre County, and Tyrone Railroad." *Proc. Amer. Phil. Soc.*, Vol. XIV, p. 176. Philadelphia, 1876.

Black, with geological indications.

297.

- 1875—Wrigley (H. E.).** Map B, the Pennsylvania oil regions proper, with all adjoining developments in Ohio, New York and West Virginia.

Accompanying "2d Geol. Surv. Pennsylvania." Special report on the petroleum of Pennsylvania, by Henry E. Wrigley, Vol. J. Harrisburg, 1875.

Black etching.

298.

- 1875—Frazer (P., jr.) and Lehman (A. E.).** General map of the ore ranges of York and Adams Counties. Scale, 3 miles to 1 inch.

Accompanying "2d Geol. Surv. Pennsylvania." Report of progress in York and Adams Counties, by Persifer Frazer. Vol. C, p. 64. Harrisburg, 1876.

299.

- 1876—Boyd (E. F.).** Map of the first and second anthracite coal fields of Pennsylvania.

Accompanying "Remarks on the coal measures and oil produce of the United States of America, collected during a visit to that country in the autumn of 1875." *Trans. North of England Inst. Mining Engrs.*, Vol. XXV, Plate XLIV. Newcastle-upon-Tyne, 1876.

300.

- 1876—Boyd (E. F.).** Map showing the anthracite coal fields of Pennsylvania with their outlets to tide-water.

Accompanying "Remarks on the coal measures and oil produce of the United States of America, collected during a visit to that country in the autumn of 1875." *Trans. North of England Inst. Mining Engrs.*, Vol. XXV, Plate XLV. Newcastle-upon-Tyne, 1876.

Black etching.

301.

- 1876—Boyd (E. F.).** Map of the anthracite coal fields of Pennsylvania.

Accompanying "Remarks on the coal measures and oil produce of the United States of America, collected during a visit to that country in the autumn of 1875." *Trans. North of England Inst. Mining Engrs.*, Vol. XXV, Plate XLVI. Newcastle-upon-Tyne, 1876.

(68)

302.

**1876—Boyd (E. F.).** Oil regions of Pennsylvania, U. S.

Accompanying "Remarks on the coal measures and oil produce of the United States of America, collected during a visit to that country in the autumn of 1875." Trans. North of England Inst. Mining Engrs., Vol. XXV, Plate XLIX. Newcastle-upon-Tyne, 1876.

Black, with geological indications.

303.

**1876—Lesley (J. P.) and White (I. C.).** Map of southern Butler, showing outcrops of the lower coals. Scale, 2 miles to the inch.

Accompanying "2d Geol. Surv. Pennsylvania." Report of progress in the Beaver River district, by I. C. White. Vol. Q. Harrisburg, 1878.

304.

**1876—Lesley (J. P.) and White (I. C.).** Map of North Allegheny, showing outcrops of the Pittsburgh and upper Freeport coals. Scale, 2 miles to the inch.

Accompanying "2d Geol. Surv. Pennsylvania." Report of progress in the Beaver River district, by I. C. White. Vol. Q. Harrisburg, 1878.

305.

**1876—Lesley (J. P.) and White (I. C.).** Map of Beaver County, showing outcrops of the Pittsburgh, Upper Freeport, and Kittanning coals. Scale, 2 miles to the inch.

Accompanying "2d Geol. Surv. Pennsylvania." Report of progress in the Beaver River district, by I. C. White. Vol. Q. Harrisburg, 1878.

306.

**1876—Lesley (J. P.) and Sherwood (A.).** Geological map of Potter County. Scale, 2 miles to the inch.

Accompanying "2d Geol. Surv. Pennsylvania." The geology of Potter County, by Andrew Sherwood. Vol. GGG, Harrisburg, 1880.

307.

**1876—Lesley (J. P.) and Sherwood (A.).** Geological map of Wyoming County. Scale, 2 miles to 1 inch.

Accompanying "2d Geol. Surv. Pennsylvania." The geology of Pike and Monroe Counties, by I. C. White. Report of progress. Vol. G6. Harrisburg, 1882.

In the same volume G 6 there is a large geological map of Pike and Monroe Counties, with the date of 1882 on the map, and consequently posterior to the limit of this catalogue. 1881.

308.

**1876—Prime (Fred.).** Geological and topographical map showing the limestone of Lehigh County including the ranges of brown hematite ore banks.

Accompanying "2d Geol. Surv. Pennsylvania." Report of progress, 1875, '76. Lehigh district. Vol. DD. Harrisburg, 1878.

In four sheets.

(69)



309.

**1876—Schellenberg (F. Z.).** Map showing outcrops of Pittsburgh coal in North Huntingdon Township, Westmoreland County, Pa.

Accompanying "2d Geol. Surv. Pennsylvania." Report of progress, 1876. Fayette and Westmoreland districts, by J. J. Stevenson. Vol. KK, p. 350. Harrisburg, 1877.

Black etching.

310.

**1876—Sherwood (A.).** Geological map of Bradford County. Scale, 2 miles to 1 inch.

Accompanying "2d Geol. Surv. Pennsylvania." Report of progress in Bradford and Tioga Counties. Vol. G. Harrisburg (1878).

No date on the volume.

311.

**1876—Sherwood (A.).** Geological map of Tioga County. Scale, 2 miles to 1 inch.

Accompanying "2d Geol. Surv. Pennsylvania." Report of progress in Bradford and Tioga Counties. Vol. G. Harrisburg (1878).

No date on the volume.

312.

**1876—Stevenson (J. J.) and White (I. C.).** Geological map of Allegheny County.

Accompanying "2d Geol. Surv. Pennsylvania." Report of progress, 1876. Fayette and Westmoreland district. Vol. KK. Harrisburg, 1877.

313.

**1877—Lesley (J. P.) and Platt (F.).** A geological map of the Salisbury central coal basin in Somerset County, Pa.

Accompanying "2d Geol. Surv. Pennsylvania." Report of progress. Vol. HHH. Harrisburg, 1877.

Black, without truly any geological indications or signs.

314.

**1877—Stevenson (J. J.).** Geological map of Fayette County west of Chestnut Ridge. Scale, 2 miles to 1 inch.

Accompanying "2d Geol. Surv. Pennsylvania." Report of progress, 1876. Fayette and Westmoreland district. Vol. KK. Harrisburg, 1877.

315.

**1877—Stevenson (J. J.).** Geological map of Westmoreland County west of Chestnut Ridge. Scale, 2 miles to 1 inch.

Accompanying "2d Geol. Surv. Pennsylvania." Report of progress, 1876. Fayette and Westmoreland district. Vol. KK. Harrisburg, 1877.

(70)

316.

- 1878—Ashburner (C. A.).** Isometric projection to illustrate the direction and amount of throw along the plan of the fault at Three Springs, Huntingdon County. Scale, 800 feet to 1 inch.

Accompanying "2d Geol. Surv. Pennsylvania." Report of progress in the Juniata district. Vol. F. Plate XVIII. Harrisburg, 1878.

Black, with geological indications.

317.

- 1878—Ashburner (C. A.).** Geological map of a belt of country lying along the line of the East Broad Top Railroad, from the crest of Sideling Hill across Smith's, Hare's, and Great Aughwick Valleys to the crest of Black Log Mountain, Huntingdon County. Scale, 1,600 feet to 1 inch.

Accompanying "2d Geol. Surv. Pennsylvania." Report of progress in the Juniata district. Vol. F. Plate I. Harrisburg, 1878.

318.

- 1878—Ashburner (C. A.).** Geological map of the environs of Orbisonia, at Rockhill Gap, Huntingdon County, showing the outcrops of the Clinton, Oriskany, and Marcellus iron beds.

Accompanying "2d Geol. Surv. Pennsylvania." Report of progress in the Juniata district. Vol. F. Plate II. Harrisburg, 1878.

319.

- 1878—Ashburner (C. A.).** Geological section passing near Three Springs, Huntingdon County, constructed from exposures on and near the line of the East Broad Top Railroad, showing the order of the Devonian and Silurian strata from Plank Cabin Valley to Black Log Mountain. Scale, 1,600 feet to 1 inch.

Accompanying "2d Geol. Surv. Pennsylvania." Report of progress in the Juniata district. Vol. F. Plate XVI. Harrisburg, 1878.

In two sheets. This section is accompanied by fragments of geological maps.

320.

- 1878—Ashburner (C. A.).** Geological section of Devonian and Silurian strata exposed along Sideling Hill Creek, extending from the East Broad Top coal basin, Huntingdon County, to the crest of Black Log Mountain, at Potts Gap, Fulton County. Scale, 1,600 feet to 1 inch.

Accompanying "2d Geol. Surv. Pennsylvania." Report of progress in the Juniata district. Vol. F. Plate XVII. Harrisburg, 1878.

In two sheets. This section is accompanied by fragments of geological maps.

321.

- 1878—Frazer (P., jr.).** Geological map of Lancaster County. Scale, 2 miles to 1 inch.

Accompanying "2d Geol. Surv. Pennsylvania." Report of progress in 1877; the geology of Lancaster County. Vol. CCC. Harrisburg, 1880.

(71)

322.

**1878—Lesley (J. P.) and White (I. C.).** Geological map of Lawrence County. Scale, 2 miles to the inch.

Accompanying "2d Geol. Surv. Pennsylvania." The geology of Lawrence County, by I. C. White. Vol. QQ. Harrisburg, 1878.

323.

**1878—Lesley (J. P.) and Frazer (P., jr.).** Geological map of Lancaster County. Scale, 2 miles to the inch.

Accompanying "2d Geol. Surv. Pennsylvania." Vol. CCC. Atlas. Harrisburg, 1879.

324.

**1878—Lesley (J. P.) and Platt (W. G.).** Geological map of Indiana County. Scale, 2 miles to the inch.

Accompanying "2d Geol. Surv. Pennsylvania." Report of progress in Indiana County, by W. G. Platt. Vol. H4. Harrisburg, 1878.

325.

**1878—Prime (Fred.).** Map of the iron-ore mines at Ironton, Lehigh County. Scale, 300 feet for 1 inch.

Accompanying "2d Geol. Surv. Pennsylvania." Report of progress, 1875-'76, Lehigh district. Vol. DD. Harrisburg, 1878.

326.

**1878—Stevenson (J. J.).** Geological map of Westmoreland County. Scale, 2 miles to 1 inch.

Accompanying "2d Geol. Surv. Pennsylvania." Report of progress, 1877, Ligonier Valley, by J. J. Stevenson. Vol. KKK. Harrisburg, 1878.

327.

**1878—Stevenson (J. J.).** Geological map of Washington County. Scale, 2 miles to 1 inch.

Accompanying "2d Geol. Surv. Pennsylvania." Report of progress, 1877, Ligonier Valley. Vol. KKK. Harrisburg, 1878.

328.

**1878—Stevenson (J. J.).** Geological map of Fayette County. Scale, 2 miles to 1 inch.

Accompanying "2d Geol. Surv. Pennsylvania." Report of progress, 1877, Ligonier Valley. Vol. KKK. Harrisburg, 1878.

329.

**1878—Stevenson (J. J.).** Geological map of Green County, with depth of the Pittsburgh and Waynesburg coal at various localities. Scale, 2 miles to 1 inch.

Accompanying "2d Geol. Surv. Pennsylvania." Report of progress, 1877, Ligonier Valley. Vol. KKK. Harrisburg, 1878.

(72)

330.

- 1879—Ashburner (C. A.) and Sheafer (A. W.).** A geological map of McKean County, and a map of a portion of Cattaraugus County, New York. Scale,  $1\frac{1}{2}$  miles to 1 inch, or  $\frac{1}{85040}$ .  
Accompanying "2d Geol. Surv. Pennsylvania." The geology of McKean County, by Chas. A. Ashburner. Atlas R, Plate X. Harrisburg, 1880.

331.

- 1879—Burlingame (E. H.).** A topographical map of part of the Little Pine Creek coal basin in Pine Township, Lycoming County. Contour curves 10 feet apart. Scale, 1,600 feet to 1 inch.  
Accompanying "2d Geol. Surv. Pennsylvania." Report of progress, geology of Lycoming County, by Franklin Platt. Vol. GG. Harrisburg, 1880.  
This map, in two sheets, is in black etching and in one color, with geological indications, and is published by permission of the author.

332.

- 1879—Carll (J. F.) and Chance (H. M.).** Geological map of Venango County. Scale, 2 miles to 1 inch.  
Accompanying "2d Geol. Surv. Pennsylvania." The geology of the oil regions of Warren, Venango, Clarion, and Butler Counties. Oil region maps and charts. Vol. III. Plate 20. Harrisburg, 1880.

333.

- 1879—Chance (H. M.).** Geological map of Clinton County. Scale, 2 miles to 1 inch.  
Accompanying "2d Geol. Surv. Pennsylvania." Report of progress, Clinton County. Vol. G4. Harrisburg, 1880.

334.

- 1879—Chance (H. M.).** Geological map of Clarion County. Scale, 2 miles to 1 inch.  
Accompanying "2d Geol. Surv. Pennsylvania." The geology of Clarion County, by H. Martyn Chance. VV, Plate II. Harrisburg, 1880.

335.

- 1879—Frazer (P., jr.).** Geological map of York County. Scale, 2 miles to 1 inch.  
Accompanying "2d Geol. Surv. Pennsylvania." Report of progress in 1877. Vol. CCC. Harrisburg, 1880.

336.

- 1879—Lesley (J. P.) and Ashburner (C. A.).** Topographical map of the Alton coal basin. Scale, 3,200 feet to the inch. Contour lines, 100'.  
Accompanying "2d Geol. Surv. Pennsylvania." McKean County. Vol. R. Atlas. Harrisburg, 1879.  
Coloured geologically.

(73)

337.

**1879—Lesley (J. P.) and Chance (H. M.).** Geological map of northern Butler. Scale, 2 miles to the inch.

Accompanying "2d Geol. Surv. Pennsylvania." The northern townships of Butler County, by H. Martyn Chance. Vol. V. Harrisburg, 1879.

338.

**1879—Lesley (J. P.) and Chance (H. M.).** Map of instrumental survey of the valleys of the Beaver and Shenango Rivers and Slippery Rock Creek. Scale, 8,000 feet to 1 inch.

Accompanying "2d Geo. Surv. Pennsylvania." The northern townships of Butler County, by H. Martyn Chance. Vol. V. Harrisburg, 1879.

339.

**1879—Lesley (J. P.) and Chance (H. M.).** A map in 24 contour lines of the Allegheny Valley near Parker, in Armstrong and Butler Counties. Scale, 1,200=1 inch.

Accompanying "2d Geo. Surv. Pennsylvania." The northern townships of Butler County, by H. Martyn Chance. Vol. V. Harrisburg, 1879.

Black etching.

340.

**1879—Lesley (J. P.) and White (I. C.).** Geological map of Mercer County. Scale, 2 miles to the inch.

Accompanying "2d Geo. Surv. Pennsylvania." The geology of Mercer County, by I. C. White. Vol. QQQ. Harrisburg, 1880.

341.

**1879—Lesley (J. P.) and Frazer (P. jr.).** Geological map of York County. Scale, 2 miles to the inch.

Accompanying "2d Geo. Surv. Pennsylvania." Vol. CCC. Atlas. Harrisburg, 1879.

342.

**1879—Sherwood (A.).** Geological map of Lycoming County. Scale, 2 miles to the inch.

Accompanying "2d Geol. Surv. Pennsylvania." The geology of Lycoming and Sullivan counties. Field notes, by Andrew Sherwood. Coal basins, by Franklin Platt. Vol. GG. Harrisburg, 1880.

343.

**1879—Sherwood (A.).** Geological map of Sullivan County. Scale, 2 miles to the inch.

Accompanying "2d Geol. Surv. Pennsylvania." Report of progress in Sullivan County, by Franklin Platt. Vol. GG. Harrisburg, 1880.

Field notes, by Andrew Sherwood. Coal basins, by Franklin Platt.

(74)

344.

**1880—Platt (W. G.).** Geological map of Armstrong County. Scale, 2 miles to 1 inch.

Accompanying "2d Geol. Surv. Pennsylvania." Report of progress in Armstrong County. Vol. H5. Harrisburg, 1880.

345.

**1880—Platt (W. G.).** Geological map of Jefferson County. Scale, 2 miles to 1 inch.

Accompanying "2d Geol. Surv. Pennsylvania." Report of progress in Jefferson County. Vol. H6. Harrisburg, 1881.

346.

**1880—White (I. C.).** Geological map of Crawford and Erie Counties. Scale, 2 miles to the inch.

Accompanying "2d Geol. Surv. Pennsylvania." The geology of Erie and and Crawford Counties, by I. C. White. Vol. Q. Harrisburg, 1881.  
In two sheets.

347.

**1881—Ashburner (C. A.).** Map of part of the Mahanoy and Shenandoah basins in the second anthracite coal fields, showing the shape of the floor of the mammoth bed by contour lines 50 feet apart, and the area of the bed worked out and under development. Scale, 1,000 feet to 1 inch, 12 meters to 1 millimeter  $\frac{1}{12000}$  of nature.

Accompanying "New method of mapping the anthracite coal fields of Pennsylvania." Trans. Amer. Inst. Mining Engrs., Vol. IX, Ashburner, Plate I, p. 516. Easton, Pa., 1881.

In colored etching and geological indications, it is essentially the same as the map in "2d Geol. Surv. Pennsylvania," Vol. A 2, by Ashburner, C. A., and Sheaffer, A. W., 1881—No. 348.

348.

**1881—Ashburner (C. A.) and Sheaffer (A. W.).** Map of part of the Mahanoy and Shenandoah basins in the second anthracite coal field. Scale, 800 feet to 1 inch.

Accompanying "2d Geol. Surv. Pennsylvania." A special report upon the causes, kinds, and amount of waste in mining anthracite, by Franklin Platt. Vol. A2. Harrisburg, 1881.

In colored etching and geological indications. This map also appeared in Trans. Amer. Inst. Mining Engrs., Vol. IX, p. 516—No. 347.

349.

**1881—Harden (E. B.).** Geological model of part of Blair, Bedford, and Huntingdon Counties, Pennsylvania. Scale, 5 miles to the inch.

Accompanying "Proc. Amer. Phil. Soc.," Vol. XIX, No. 109. Philadelphia, 1881.

In black, with numbers corresponding to colours; apparently a phototype.

(75)

350.

- 1881—Platt (F.).** Topographical and geological map of that part of Blair, Bedford, and Huntingdon Counties, south of the Little Juniata River, between Tussey and Alleghany Mountains, including Morrison's Cove, Canoe, Sinking, and Scotch Valleys. Scale, 1,600 feet to 1 inch.

Accompanying "2d Geol. Surv. Pennsylvania." Blair atlas, T. Harrisburg, 1881.

In fourteen sheets.

351.

- 1881—Platt (F.).** Index to the topographical and geological map of that part of Blair, Bedford, and Huntingdon Counties, south of the Little Juniata River, between Tussey and Alleghany Mountains, including Morrison's Cove, Canoe, Sinking, and Scotch Valleys. Scale, 8,000 feet to 1 inch.

Accompanying "2d Geol. Surv. Pennsylvania." Blair atlas, T. Harrisburg, 1881.

352.

- 1881—White (I. C.).** Geological map of Susquehanna and Wayne Counties, and a part of Lackawanna County.

Accompanying "2d Geol. Surv. Pennsylvania." The geology of Susquehanna and Wayne County, by I. C. White, Vol. G 5. Harrisburg, 1881.

(76)

**X—OHIO, INDIANA, AND MICHIGAN.**

353.

- 1836—Hildreth (S. P.).** A topographical and geological map of the coal measures, and of the muriatiferous and ferruginous deposits in the secondary region of the valley of the Ohio.

Accompanying "Observations on the bituminous coal deposits of the valley of the Ohio and the accompanying rock strata." Amer. Journ. Silliman, Vol. XXIX. New Haven, 1836.

Black etching, and with geological indications.

354.

- 1838—Locke (John).** Geological map of Adams County, Ohio.

Accompanying "Second annual report on the geological survey of the State of Ohio," p. 238. Columbus, 1838.

Black, with geological indications.

355.

- 1844—Locke (John).** Geological and magnetical chart of Copper Harbor (Lake Superior). Scale, 2½ inches to a mile.

Accompanying "Observations made in the years 1838, '39, '40, '41, '42, and '43, to determine the magnetical dip, etc." Trans. Amer. Phil. Soc. New series. 4<sup>o</sup>. Vol. IX, Article XI, Plate XLV. Philadelphia, 1846.

Black etching, and geological indications.

356.

- 1845—Burt (W. A.).** Geological map of township lines in the northern peninsula of Michigan.

Accompanying "Geological report." Message from the President of the United States, Part III, p. 811. Washington, 1849.

Black, with lithological indications.

357.

- 1845—Houghton (Douglass).** Geological map of townships in the northern peninsula of Michigan.

Accompanying "Geological report." Message from the President of the United States, Part III, p. 880. Washington, 1849.

Black, with lithological indications.

358.

- 1846—Burt (W. A.).** Geological map of a district of township lines in the northern peninsula of Michigan.

Accompanying "Geological report." Message from the President of the United States, Part III, p. 811. Washington, 1849.

Black, with lithological indications.



359.

- 1846—Higgins (S. W.) and Hubbard (Bela).** Geological map of a district E. and W. of the Ontonagon (Lake Superior).

Accompanying "Geological report." Message from the President of the United States, Part III, p. 533. Washington, 1849.

Black, with lithological indications.

360.

- 1846—Hubbard and Ives.** Geological map of the district subdivided by Messrs. Hubbard and Ives.

Accompanying "Geological report of Bela Hubbard." Message from the President of the United States, Part III, p. 852. Washington, 1849.

A map of the district between L'Anse and Granite Point, Lake Superior. In black, with lithological indications.

361.

- 1848—Whittlesey (Charles).** Outline map of the geological formation of Ohio.

Accompanying "Outline sketch of the geology of Ohio," in Howe's Historical Collections, p. 579. (Cleveland), 1848.

Black etching, with geological indications. Reprinted in 1856.

362.

- 1849—Jackson (C. T.).** Geological map of Keweenaw Point, Lake Superior.

Accompanying "Report on the geological survey of the mineral lands of the United States in the State of Michigan." Message from the President of the United States. Part III. Washington, 1849.

363.

- 1849—Jackson (C. T.).** Geological map of Isle Royale, Lake Superior.

Accompanying "Report on the geological survey of the mineral lands of the United States in the State of Michigan." Message from the President of the United States. Part III. Washington, 1849.

364.

- 1850—Foster (J. W.) and Whitney (J. D.).** Geological map of Keweenaw Point, Lake Superior, Michigan; assisted by S. W. Hill and W. Schlatter.

Accompanying "Report on the geology and topography of a portion of the Lake Superior land district in the State of Michigan." Part I. Copper lands. Washington, 1850.

365.

- 1850—Foster (J. W.) and Whitney (J. D.).** Geological map of Isle Royale, Lake Superior, Michigan; assisted by S. W. Hill and W. Schlatter.

Accompanying "Report on the geology and topography of a portion of the Lake Superior land district in the State of Michigan." Part I. Copper lands. Washington, 1850.

(78)

366.

- 1850—Foster (J. W.) and Whitney (J. D.).** Geological map of the district between Portage Lake and Montreal River, Lake Superior, Michigan; assisted by S. W. Hill and W. Schlatter.

Accompanying "Report on the geology and topography of a portion of the Lake Superior land district in the State of Michigan." Part I. Copper lands. Washington, 1850.

367.

- 1851—Foster (J. W.) and Whitney (J. D.).** Geological map of the Lake Superior land district in the State of Michigan.

Accompanying "Report on the geology of the Lake Superior land district." Part II. The iron region, together with the general geology. Washington, 1851.

368.

- 1851—Anonymous (Foster (J. W.) and Whitney (J. D.)).** Section and diagram illustrating the geology of the region between the northern shores of Lakes Superior and Michigan.

Accompanying "Report on the geology of the Lake Superior land district." Part II. The iron region, together with the general geology. Washington, 1851.

No name of authors on the map, but certainly by Foster and Whitney.

369.

- 1851—Foster (J. W.) and Whitney (J. D.).** Geological map of the district between Keweenaw Bay and Chocolate River, Lake Superior, Michigan.

Accompanying "Report on the geology of the Lake Superior land district." Part II. The iron region, together with the general geology. Washington, 1851.

370.

- 1851—Koch (F. C. L.).** Geognostische Karte der Mineral-Regionen am Lake Superior, Michigan, North Amer.

Accompanying "Die Mineral-Regionen der obern Halbinsel Michigan's (N. A.) am Lake Superior und die Isle Royal. Göttingen, 1852.

371.

- 1853—Whitney (J. D.).** Geological map of Keweenaw Point, Lake Superior, Michigan. folio. New York, 1853.

Mr. Whitney was assisted by S. W. Hill and W. S. Stephens.

372.

- 1855—Rivot (L. E.).** Carte géologique du Lac Supérieur, État de Michigan, dressée par MM. J. W. Foster et J. D. Whitney.

Accompanying "Voyage au Lac Supérieur." Annales des mines, 5<sup>e</sup> série, tome VII, p. 173, pl. VI. Paris, 1855.

Also issued separately.

(79)

373.

- 1855—Rivot (L. E.).** Cartes de l'île Royale, de la Pointe de Keweenaw et de l'Ontonagon, dressées par MM. Foster et Whitney.

Accompanying "Voyage au Lac Supérieur." Paris, 1855.

374.

- 1856—Newberry (J. S.).** Map of the A. and N. L. R. R., its connections and geology. (Ohio.)

Accompanying "Report on the economical geology of the route of the Ash-tabula and New Lisbon Railroad." Cleveland, 1857.

Black etching and geological indications.

375.

- 1856—Whittlesey (Charles).** Outline map of the geological formation of Ohio.

Accompanying "Outline sketch of the geology of Ohio; in outlines of the geology of Ohio," p. 579. Cleveland, 1856.

Black etching, with geological indications. Reprint of the map of 1848.

See **Whittlesey** (Charles), 1848—No. 361.

376.

- 1856—Whittlesey (Charles).** Geological railroad and township map of the State of Ohio. Geological outlines by Charles Whittlesey. Scale, 12 miles to the inch.

Accompanying "Outlines of the geology of Ohio." Cleveland, 1856.

Reprinted in 1873 to compare with a reprint of J. S. Newberry's map of Ohio of 1867, in "Paleontology and the moral sense," by C. Whittlesey.

377.

- 1865—Saylor (N.).** Geological map of Ohio. Scale, 5 miles to the inch. Cincinnati, Ohio, 1865.

Unseen.

378.

- 1865—Saylor (N.).** Geological map of Indiana. Scale, 5 miles to the inch. Cincinnati, Ohio, 1865.

Unseen.

379.

- 1865—Winchell (Alexander).** Map of the Grand Traverse region (Michigan).

Accompanying "A report on the geological and industrial resources of the counties of Antrim, Grand Traverse, Benzie, and Leelanaw in the Lower Peninsula of Michigan." Ann Arbor, 1866.

Black, with dotted lines and geological indications.

380.

- 1867—Newberry (J. S.).** Geological map of Ohio.

Accompanying "Stebbins's atlas of Ohio." (——.)

Unseen.

(80)

381.

- 1869—Brooks (T. B.).** Map of Republic Mountain and vicinity, Marquette County, Michigan. Scale,  $\frac{1}{4800}$  = 400 feet to the inch.

Accompanying "Geological survey of Michigan." Atlas folio. 1873. Plate VI. New York, 1873.

382.

- 1869—Credner (H.).** Geognostische Uebersichts-Karte der Eisenregionen der oberen Halbinsel von Michigan.

Accompanying "Die vorsilurischen Gebilde der oberen Halbinsel von Michigan in Nord-America." Zeitsch. Deut. Geol. Gesells. Vol. XXI. Taf. VIII. Berlin, 1869.

Black etching, and geological indications.

383.

- 1869—Whittlesey (Charles).** Geological map of Eastern Ohio.

Accompanying "The physical geology of Eastern Ohio." Memoirs Boston Soc. Nat. Hist., Vol. I, p. 598. Boston, 1869.

384.

- 1870—Newberry (J. S.).** Preliminary geological map of Ohio.

Accompanying "Geological survey of Ohio", 1869. Columbus, 1871.

385.

- 1871—Gilbert (G. K.)** Map of Lucas County, colored to show the geological structure.

Accompanying "Geological survey of Ohio", Geology. Vol. I, p. 573. Columbus, 1873.

386.

- 1872—Brooks (T. B.).** Map of the Menominee iron region, upper peninsula, Michigan. Scale, 7,040 feet to one inch or  $\frac{3}{4}$  inch to a mile.

Accompanying "Geological survey of Michigan." Atlas folio. 1873. Plate IV. New York, 1873.

387.

- 1872—Brooks (T. B.).** Map of the Marquette iron region, upper peninsula, Michigan. Scale, 7,040 feet to the inch.

Accompanying "Geological survey of Michigan." Atlas folio. 1873. Plate III. New York, 1873.

388.

- 1872—Stevenson (J. J.).** Map to show limits of the upper coal measures in Ohio.

Accompanying "The upper coal measures west of the Alleghany Mountains." Annals of Lyceum of Natural History of New York, Vol. X. Plate XII. New York, 1874.

(81)

389.

- 1873—Borden (W. W.).** Geological maps of Clark and Floyd Counties, Indiana.

Accompanying "Fifth annual report of the geological surv. of Indiana, made during the year 1873", by E. T. Cox. Indianapolis, 1874.

390.

- 1873—Collett (John).** (Geological) map of Lawrence County, Indiana.

Accompanying "Fifth annual report of the geological surv. of Indiana." Indianapolis, 1874.

Black, with geological indications.

391.

- 1873—Newberry (J. S.).** Geological map of Ohio.

Accompanying "Paleontology and the moral sense," by Charles Whittlesey, p. 9. Cleveland, 1873.

See Newberry (J. S.), 1867—No. 384.

392.

- 1873—Newberry (J. S.).** Geological map of Cuyahoga County.

Accompanying "Geological survey of Ohio." Geology. Vol. I, p. 171. Columbus, 1873.

393.

- 1873—Newberry (J. S.).** Geological map of Clarke County.

Accompanying "Geological survey of Ohio." Geology. Vol. I, p. 480. Columbus, 1873.

394.

- 1873—Newberry (J. S.).** Geological map of Summit County.

Accompanying "Geological survey of Ohio." Geology. Vol. I, p. 201. Columbus, 1873.

395.

- 1873—Orton (Edward).** Map showing lines of junction of Cincinnati group and Clinton limestone, or of Lower and Upper Silurian, in Southwestern Ohio. Scale, 5 miles to 1 inch.

Accompanying "Geological survey of Ohio." Geology. Vol. I, p. 413. Columbus, 1873.

396.

- 1873—Pumpelly (Raphael).** Map to accompany the cross-sections of the Portage Lake district. Scale, 1=12,000.

Accompanying "Geological survey of Michigan." Atlas folio. 1873. Plates XIVa and XIVb. New York, 1873.

A. R. Marvine and L. G. Emerson, assistants; in two sheets.

397.

- 1873—Pumpelly (Raphael).** Map to accompany the cross sections of the Eagle River district. Scale, 1 : 4,800 (or) 400 feet to an inch.

Accompanying "Geological survey of Michigan." Atlas folio. 1873. Plate XX. New York, 1873.

A. R. Marvine and S. B. Ladd, assistants.

(82)

405.

- 1873—Read (M. C.).** Geological map of Ashtabula, Lake, Geauga, and Trumbull Counties.

Accompanying "Geological survey of Ohio." *Geology*. Vol. I, p. 483. Columbus, 1873.

399.

- 1873—Rominger (Charles), Pumpelly (Raphael) & Brooks (T. B.).** Map of the Upper Peninsula. Palæozoic rocks, by C. Rominger; copper-bearing rocks, by R. Pumpelly; iron-bearing rocks (Huronian), by T. B. Brooks; Laurentian rocks, by Brooks & Pumpelly. Scale, 13 miles to an inch, 8333333.

Accompanying "Geological survey of Michigan." *Atlas folio*. 1873. Plate I. New York.

400.

- 1873—Whittlesey (Charles).** Geological map of Ohio. Geological outlines, by Charles Whittlesey, 1856.

Accompanying "Paleontology and the moral sense," p. 8. Cleveland, 1873.

See **Whittlesey** (Charles), 1856, a reduction in black, with indications by numbers—No. 376.

401.

- 1873—Winchell (N. H.).** Geological map of Wyandot County.

Accompanying "Geological survey of Ohio." *Geology*. Vol. I, p. 625. Columbus, 1873.

402.

- 1873—Winchell (N. H.).** Geological map of Marion County.

Accompanying "Geological survey of Ohio." *Geology*. Vol. I, p. 640. Columbus, 1873.

403.

- 1873—Winchell (N. H.).** Geological map of Seneca County.

Accompanying "Geological survey of Ohio." *Geology*. Vol. I, p. 611. Columbus, 1873.

404.

- 1873—Winchell (N. H.).** Geological map of Sandusky County.

Accompanying "Geological survey of Ohio." *Geology*. Vol. I, p. 593. Columbus, 1873.

405.

- 1874—Newberry (J. S.).** Geological map of Erie County, and the Islands.

Accompanying "Geological survey of Ohio." Vol. II, p. 185. Columbus, 1874.

406.

- 1874—Orton (Edward).** Geological map of Highland, Ross, and Pike Counties.

Accompanying "Geological survey of Ohio," Vol. II, p. 611. Columbus, 1874.

(83)

407.

**1874—Orton (Edward).** Geological map of Green County.

Accompanying "Geological survey of Ohio," Vol. II, p. 659. Columbus, 1874.

408.

**1874—Winchell (N. H.).** Geological map of Defiance County.

Accompanying "Geological survey of Ohio," Vol. II, p. 422. Columbus, 1874.

409.

**1874—Winchell (N. H.).** Geological map of Ottawa County.

Accompanying "Geological survey of Ohio," Vol. II, p. 227. Columbus, 1874.

410.

**1874—Winchell (N. H.).** Geological map of Crawford County.

Accompanying "Geological survey of Ohio," Vol. II, p. 237. Columbus, 1874.

411.

**1874—Winchell (N. H.).** Geological map of Morrow County.

Accompanying "Geological survey of Ohio," Vol. II, p. 253. Columbus, 1874.

412.

**1874—Winchell (N. H.).** Geological map of Delaware County.

Accompanying "Geological survey of Ohio," Vol. II, p. 272. Columbus, 1874.

413.

**1874—Winchell (N. H.).** Geological map of Van Wert County.

Accompanying "Geological survey of Ohio," Vol. II, p. 314. Columbus, 1874.

414.

**1874—Winchell (N. H.).** Geological map of Union County.

Accompanying "Geological survey of Ohio," Vol. II, p. 324. Columbus, 1874.

415.

**1874—Winchell (N. H.).** Geological map of Paulding County.

Accompanying "Geological survey of Ohio," Vol. II, p. 336. Columbus, 1874.

416.

**1874—Winchell (N. H.).** Geological map of Harding County.

Accompanying "Geological survey of Ohio," Vol. II, p. 354. Columbus, 1874.

417.

**1874—Winchell (N. H.).** Geological map of Hancock County.

Accompanying "Geological survey of Ohio," Vol. II, p. 358. Columbus, 1874.

(84)

418.

**1874—Winchell (N. H.).** Geological map of Wood County.

Accompanying "Geological survey of Ohio," Vol. II, p. 368. Columbus, 1874.

419.

**1874—Winchell (N. H.).** Geological map of Putnam County.

Accompanying "Geological survey of Ohio," Vol. II, p. 387. Columbus, 1874.

420.

**1874—Winchell (N. H.).** Geological map of Henry County.

Accompanying "Geological survey of Ohio," Vol. II, p. 416. Columbus, 1874.

421.

**1875—Sauvage (M. E.).** Carte de la région ferrifère de Michigan. Scale,

$\frac{1}{1000000}$ .

Accompanying "Notice sur les minerais de Fer du Lac Supérieur." Annales des mines, 7<sup>e</sup> série, tome VIII, Pl. I. Paris, 1875.

In black etching and one color.

422.

**1875—Whittlesey (Charles).** Physical geology of Lake Superior. Scale, 50 miles to  $\frac{1}{8}$  inch.

Accompanying "Physical geology of Lake Superior." Proceedings of American Association for the Advancement of Science, Vol. XXIV, p. 64. Salem, 1876.

423.

**1876—Rominger (Charles).** Geological map of the lower peninsula. Scale, 13 miles to one inch, or 1:823,680.

Accompanying "Geological survey of Michigan," Vol. III, Part I. New York, 1876.

424.

**1876—Spencer (J. W.).** Keweenaw Point. Scale, 20 miles to the inch.

Accompanying "On the Nipigon or copper-bearing rocks of Lake Superior," with notes on copper mining in that region. The Canadian Naturalist and Geologist, new series, Vol. VIII, p. 55. Montreal, 1878.

Black etching.

425.

**1878—Hill (F. O.)** Map of Logan and Champaign Counties.

Accompanying "Geological survey of Ohio." Geology. Vol. III, p. 491. Columbus, 1878.

426.

**1878—Newberry (J. S.).** Map of Portage County.

Accompanying "Geological survey of Ohio." Geology. Vol. III, p. 133. Columbus, 1878.

(85)



427.

**1878—Orton (Edward).** Map of Butler County.Accompanying "Geological survey of Ohio." Geology. Vol. III, p. 399.  
Columbus, 1878.

428.

**1878—Orton (Edward).** Map of Preble County.Accompanying "Geological survey of Ohio." Geology. Vol. III, p. 404.  
Columbus, 1878.

429.

**1878—Orton (Edward).** Map of Franklin County.Accompanying "Geological survey of Ohio." Geology. Vol. III, p. 600.  
Columbus, 1878.

430.

**1878—Orton (Edward).** Map of Warren County.Accompanying "Geological survey of Ohio." Geology. Vol. III, p. 392.  
Columbus, 1878.

431.

**1878—Read (M. C.).** Map of Huron County.Accompanying "Geological survey of Ohio." Geology. Vol. III, p. 299.  
Columbus, 1878.

432.

**1878—Read (M. C.).** Map of Richland, Ashland, Wayne, Knox, Holmes, Coshocton, and Licking Counties.Accompanying "Geological survey of Ohio." Geology. Vol. III, p. 529.  
Columbus, 1878.

433.

**1878—Stevenson (J. J.).** Map to show limits of the Upper Coal Measures in Ohio, north from Central Ohio R. R.Accompanying "Geological survey of Ohio." Geology. Vol. III, p. 209.  
Columbus, 1878.

In black, with a dotted line showing the western and northern boundary of the Pittsburgh coal.

434.

**1878—West (A. W.).** Map of Medina County.Accompanying "Geological survey of Ohio." Geology. Vol. III, p. 363.  
Columbus, 1878.

435.

**1879—Newberry (J. S.), Andrews (E. B.), Orton (Edward), Read (M. C.), Gilbert (G. K.), Winchell (N. H.), and Hill (F. C.).** Geological map of the State of Ohio.

Accompanying "Geological survey of Ohio." Atlas folio. New York, 1879.

Six sheets, forming a geological atlas of the State of Ohio. Published by authority of the legislature.

436.

- 1879—Wright (C. E.).** Map of the Menominee iron district and adjacent territory.

Accompanying "Annual report of the commissioner of mineral statistics of the State of Michigan for 1880." Lansing, 1881.

437.

- 1880—Collet (John).** Outline geological map of Indiana.

Accompanying "Second annual report of the department of statistics and geology of Indiana," p. 450. Indianapolis, 1880.

Black etching and geological indications. It is reprinted in the eleventh annual report of the State geologist, p. 12, 1881.

See Collet (John) 1881—No. 441.

438.

- 1880—Collet (John).** Map of Putnam County, Indiana.

Accompanying "The geology of Putnam County." Second annual report of the department of statistics and geology of Indiana, p. 397. Indianapolis, 1880.

Black etching and geological indications.

439.

- 1880—Greene (G. K.).** Map of Munroe County.

Accompanying "Geology of Munroe County." Second annual report of the department of statistics and geology of Indiana, p. 427. Indianapolis, 1880.

Black, with geological indications.

440.

- 1880—Orton (Edward).** Map of Eastern Ohio.

Accompanying "Review of stratigraphical geology of Eastern Ohio," in annual report of the Secretary of State, 1879. Columbus, 1880.

Black, with geological indications.

441.

- 1881—Collet (John).** Outline geological map of Indiana.

Accompanying "Eleventh annual report of the State geologist of Indiana," p. 12. Indianapolis, 1881.

See Collet (J.), 1880—No. 437.

442.

- 1881—Collet (John).** Map of Shelby County.

Accompanying "Geology of Shelby County accompanying eleventh annual report of State geologist of Indiana," p. 55. Indianapolis, 1882.

Black etching and geological indications.

443.

- 1881—Brown (R. T.).** Map of Fountain County, Indiana.

Accompanying "Fountain County geology, geography, &c.; eleventh annual report of the State geologist of Indiana," p. 89. Indianapolis, 1882.

Black etching and geological indications.

(87)

## 444.

**1881—Phinney (A. J.).** Map of Delaware County.

Accompanying "Geology of Delaware county; eleventh annual report of the State geologist of Indiana," p. 126. Indianapolis, 1882.

Black etching and geological indications.

## 445.

**1881—Elrod (M. N.).** Map of Bartholomew County, Indiana.

Accompanying "Geology of Bartholomew County; eleventh annual report of the State geologist of Indiana," p. 150. Indianapolis, 1882.

Black etching and geological indications.

## 446.

**1881—Rominger (Charles).** Geological map of the environs of Marquette, Negaunee, and Ishpeming. Scale,  $1\frac{1}{2}$  inch for 1 mile.

Accompanying "Geol. surv. of Michigan, upper peninsula, 1878-1880." Vol. IV. New York, 1881.

## 447.

**1881—Winchell (N. H.).** Sketch map of Isle Royale, Lake Superior.

Accompanying "Geological and Nat. Hist. Surv. of Minnesota," tenth annual report, Plate III. St. Paul, 1882.

Black, with geological indications.

**XI.—ILLINOIS, IOWA, MINNESOTA, AND WISCONSIN.**

448.

**1839—Owen (D. D.).** Chart of the great Illinois coal field.

Accompanying "Report of a geological exploration of part of Iowa, Wisconsin, and Illinois, made in the autumn of the year 1839." (Washington), 1844.

449.

**1839—Owen (D. D.).** Geological section from the mouth of Rock River through the blue mounds to the Wisconsin River in connection with a geological chart of part of Iowa, Wisconsin, and Illinois.

Accompanying "Report of geological exploration of parts of Iowa, Wisconsin, and Illinois, made in the autumn of the year 1839." Plate III. (Washington), 1844.

450.

**1839—Owen (D. D.).** Geological chart of part of Iowa, Wisconsin, and Illinois.

Accompanying "Report of a geological exploration of part of Iowa, Wisconsin, and Illinois, made in the autumn of the year 1839." (Washington), 1844.

An edition of the report was made in 1840, but without the accompanying charts. Washington is not named in the title page as the place of publication; the only inscription is, "Ordered to be printed by the Senate of the United States."

451.

**1848—Owen (D. D.).** Provisional geological map of part of the Chippewa land district of Wisconsin, with part of Iowa, and of Minnesota Territory, to illustrate the report of a geological reconnaissance made in 1847.

Accompanying "Report of a geological reconnaissance of the Chippewa land district of Wisconsin; and incidentally of a portion of the Kickapoo country, and of a part of Iowa and of the Minnesota Territory." (Washington, 1849).

Neither date nor place of publication is given, but very likely Washington is the place.

452.

**1852—Norwood (J. G.).** Geological map of parts of Minnesota and Wisconsin, designed to show portions of the rock formations now concealed by drift.

Accompanying "Report of a geological survey of Wisconsin, Iowa, and Minnesota, and incidentally of a portion of Nebraska Territory," by D. D. Owen. 4°. Volume of illustrations. Philadelphia, 1852.

453.

- 1852—Owen (Richard).** Geological map, coast view and section of Pigeon Point, northwest coast of Lake Superior.

Accompanying "Report of a geological survey of Wisconsin, Iowa, and Minnesota, and incidentally of a portion of Nebraska Territory," by D. D. Owen. 4°. Volume of illustrations. Philadelphia, 1852.

454.

- 1855—Lapham (I. A.).** A geological map of Wisconsin. New York, 1855.

One sheet folio.

455.

- 1857—[Hall (James), Whitney (J. D.), and Worthen (A. H.).]** Geological map of the eastern half of the State of Iowa; by legislative authority.

Accompanying "Report of the geological survey of the State of Iowa." Vol. I, Part I, p. 146. (Albany, N. Y.), 1858.

456.

- 1857—Norwood (J. G.).** Illinois geological survey. Diagram of the State of Illinois (colored geologically). Drawn by H. A. Uffers.

Accompanying "Abstract of a report on Illinois coals, and a general notice of coal fields." Chicago, 1857.

457.

- 1859—Whittlesey (Charles).** Geological map of the country on the upper waters of the Menominee, Peshattego, and Oconto Rivers. Scale,  $\frac{1}{16}$  of an inch to the mile.

Accompanying "Paleontology and the moral sense," by C. Whittlesey. Cleveland, 1873.

458.

- 1860—Whittlesey (Charles).** Geological map of the Penokie Range, Ashland County, Wisconsin. Scale, 6 miles to 1 inch.

Accompanying "Wisconsin geological survey." Vol. III, Appendix A, p. 215. Madison, 1880.

Reissued in black etching, one small sheet octavo, in "Paleontology and the moral sense." Cleveland, 1873.

See Whittlesey (Charles), 1873—No. 476.

459.

- 1862—Whitney (J. D.).** Geological map of the lead region in the States of Wisconsin, Illinois, and Iowa.

Accompanying "Report of geological survey of the Upper Mississippi lead region." Extract from "Report of the geological survey of the State of Wisconsin." Vol. I. Albany, 1862.

(90)

460.

**1864—Engelmann (Henry).** Map of Harding County.

Accompanying "Geological survey of Illinois." Vol. I, p. 350. Springfield, 1866.

461.

**1866—[Whitney (J. D.).]** Geological map of the northwest corner of Illinois.

Accompanying "Geological survey of Illinois." Vol. I, p. 154. Springfield, 1866. Called in the list of illustrations "Geological map of the Galena lead region." On the map there is no name of author, no date, and no scale.

462.

**1866—Whittlesey (Charles).** Mouth of Baptism River.

Accompanying "A report of explorations in the mineral regions of Minnesota during the years 1848, 1859, and 1864," p. 26. Cleveland, 1866.

Black etching and letters corresponding to geological indications in the text.

463.

**1866—Whittlesey (Charles).** Portion of the north shore in towns 51 and 52 north, ranges 12 and 13 west, St. Louis County, Minnesota. Scale,  $\frac{1}{2}$  inch to the mile.

Accompanying "A report of explorations in the mineral regions of Minnesota during the years 1848, 1859, and 1864," p. 35. Cleveland, 1866.

Black etching and letters corresponding to geological indications in the text.

464.

**1866—Whittlesey (Charles).** Mouth of the Ke-shik-on-se-kan or Cedar River, and Beaver Bay.

Accompanying "A report of explorations in the mineral regions of Minnesota during the years 1848, 1859, and 1864," p. 29. Cleveland, 1866.

Black etching and letters corresponding to geological indications in the text.

465.

**1867—Freeman (H. C.).** Map of La Salle County.

Accompanying "Geological survey of Illinois," Vol. III, p. 257. Springfield, 1868.

466.

**1869—Lapham (I. A.).** A new geological map of Wisconsin, prepared mostly from original observations. Scale, 15 miles to 1 inch. Milwaukee, 1869.

Folio.

467.

**1870—White (C. A.).** Geological map model of Iowa.

Accompanying "Report on the geological survey of the State of Iowa," Vol. I, p. 32. Des Moines, 1870.

(91)

468.

**1870—White (O. A.). Geological map of the State of Iowa.**

Accompanying "Report on the geological survey of the State of Iowa,"  
Vol. II. Des Moines, 1870.

469.

**1871—Kloos (J. H.). Orientirungs-Karte zu den geologischen Notizen aus Minnesota.**

Accompanying "Geologische Notizen aus Minnesota." Zeitsch. Deut. Geol. Gesells., Vol. XXIII, Taf. VIII, p. 472. Berlin, 1871.

Black etching. An English translation and reprint of the map has appeared in the Tenth annual report of the geological survey of Minnesota, for the year 1881.

470.

**1871—White (C. A.). Sketch map of the State of Iowa.**

Accompanying "American geological surveys." The Geological Magazine, 1st series, Vol. VIII, p. 222. London, 1871.

Black etching.

471.

**1872—Winchell (N. H.). Preliminary geological map of Minnesota.**

Accompanying "The annual report of the board of regents of the University of Minnesota for 1872." Saint Paul, 1873.

472.

**1872—Winchell (N. H.). Preliminary geological map of Minnesota.**

Accompanying "The first annual report for the year 1872 of the geological and Natural History Survey of Minnesota, p. 45. Saint Paul, 1873.

473.

**1873—Irving (R. D.). Outline geological map of northern Wisconsin. Scale, 15 miles to the inch.**

Accompanying "On the age of the copper-bearing rocks of Lake Superior," &c. Amer. Journ. Silliman, 3d series, Vol. VIII, Plate IV, p. 83. New Haven, 1874.

Black etching and geological indications.

474.

**1873—Irving (R. D.). Map showing the formations at the junction of Bad River and Tyler's Fork.**

Accompanying "Wisconsin geological survey." Vol. III, Part III, Plate XVI, p. 185. Madison, 1880.

Black etching, with geological indications.

475.

**1873—Irving (R. D.). Map showing the formations along Black River, Jackson County.**

Accompanying "Wisconsin geological survey." Vol. II, Part III, Plate XVII, p. 493. Madison, 1877.

Black etching.

(92)

476.

- 1873—Whittlesey (Charles).** Geological map of the Penokie Range, Ashland County, Wisconsin. Scale, 6 miles to 1 inch.

Accompanying "Paleontology and the moral sense." Cleveland, 1873.

See Whittlesey (Charles) 1860—No. 458.

477.

- 1874—Irring (R. D.).** Wood and portions of Clark, Jackson, Marathon, and Portage Counties. Scale, 3 miles to the inch.

Accompanying "Wisconsin geological survey." Atlas, Vol. II, Folio, Plate No. XV. Milwaukee, 1877.

478.

- 1874—Winchell (N. H.).** Geological map of the county of Freeborn, Minnesota.

Accompanying "Geological and Nat. Hist. Surv. of Minnesota." Third Annual Report, p. 148. Saint Paul, 1875.

479.

- 1874—Winchell (N. H.).** Geological map of Mower County, Minnesota.

Accompanying "Geological and Nat. Hist. Surv. of Minnesota." Third Annual Report, p. 166. Saint Paul, 1875.

480.

- 1875—Harrington (M. W.).** Geological map of Olmsted County, Minnesota.

Accompanying "Geological and Nat. Hist. Surv. of Minnesota." Fourth Annual Report, p. 75. Saint Paul, 1876.

481.

- 1875—Harrington (M. W.).** Geological map of Dodge County, Minnesota.

Accompanying "Geological and Nat. Hist. Surv. of Minnesota." Fourth Annual Report, p. 97. Saint Paul, 1876.

482.

- 1875—Harrington (M. W.).** Geological map of Steele County, Minnesota.

Accompanying "Geological and Nat. Hist. Surv. of Minnesota." Fourth Annual Report, p. 107. Saint Paul, 1876.

483.

- 1875—Winchell (N. H.).** Geological map of Fillmore County, Minnesota.

Accompanying "Geological and Nat. Hist. Surv. of Minnesota." Fourth Annual Report, p. 13. Saint Paul, 1876.

(93)



484.

- 1875—Worthen (A. H.).** Geological map of the State of Illinois. Boston, 1875.

In two large sheets, lithographed at Boston, published by Legislative Authority; there is no scale nor place of publication on it; it was drawn by Billington, W., St. John, O. H., and Worthen, C. K.

485.

- 1876—Chamberlin (T. C.).** Map of quaternary formations of eastern Wisconsin. Scale, 1 inch = 12 miles.

Accompanying "Wisconsin geological survey." Atlas, Vol. II. Folio. Plate II. Milwaukee, 1877.

486.

- 1876—Chamberlin (T. C.).** Door and parts of Kewaunee, Brown, Outagamie, Shawano, and Oconto Counties. Scale, 3 miles to the inch.

Accompanying "Wisconsin geological survey." Atlas, Vol. II. Folio. Plate XII. Milwaukee, 1877.

487.

- 1876—Chamberlin (T. C.).** Kenosha, Racine, Milwaukee, Waukesha, Walworth, Jefferson, and parts of Rock, Dodge, Washington, and Ozaukee Counties. Scale, 3 miles to the inch.

Accompanying "Wisconsin geological survey." Atlas, Vol. II. Folio. Plate X. Milwaukee, 1877.

488.

- 1876—Chamberlin (T. C.).** Fond du Lac, Sheboygan, Manitowoc, Calumet, Winnebago, and parts of Dodge, Washington, Ozaukee, Kewaunee, Brown, Outagamie, and Waupaca Counties. Scale, 3 miles to the inch.

Accompanying "Wisconsin geological survey." Atlas, Vol. II. Folio. Plate XI. Milwaukee, 1877.

489.

- 1876—Chamberlin (T. C.).** Map of subsoils of Eastern Wisconsin. Scale, 1 inch = 12 miles.

Accompanying "Wisconsin geological survey." Atlas of Vol. II. Folio. Plate III. Milwaukee, 1877.

490.

- 1876—Chamberlin (T. C.), Irving (R. D.), Strong (M.).** Iowa, Lafayette, Green, range VI in Dane, and range III in Sauk, by M. Strong. Dane and ranges IV, V, VI, in Sauk, by R. D. Irving. Rock, by T. C. Chamberlin. Scale 3 miles to the inch.

Accompanying "Wisconsin geological survey." Atlas, Vol. II. Folio. Plate XIII. Milwaukee, 1877.

(94)

491.

- 1876—Chamberlin (T. C.), and Irving (R. D.).** Juneau, Adams, Waushara, Marquette, Sauk, Columbia, and Green Lake, north of Fox River, by R. D. Irving. Green Lake and Dodge by T. C. Chamberlin. Scale, 3 miles to the inch.

Accompanying "Wisconsin geological survey." Atlas, Vol. II, folio. Plate XIV. Milwaukee, 1877.

492.

- 1876—Irving (R. D.).** Details of the structure of the Huronian series in the vicinity of Penokee Gap, T. 44, R. 3 W. Ashland County. Scale,  $\frac{1}{36256}$ .

Accompanying "Wisconsin geological survey." Atlas, Vol. III, folio. Plate XXIII. Milwaukee, 1879.

493.

- 1876—Irving (R. D.), and Strong (M.).** Trempealeau, La Crosse, Monroe, Vernon, Sauk, Richland, and Crawford Counties, by M. Strong. Juneau and Jackson Counties, by R. D. Irving. Scale, 3 miles to 1 inch.

Accompanying "Wisconsin geological survey." Atlas, Vol. III, folio. Plate XVII. Milwaukee, 1879.

494.

- 1876—Irving (R. D.).** Geological map of the Four Lake country of Dane County.

Accompanying "Wisconsin geological survey." Vol. II. Part III. Plate XXVI A, p. 613. Madison, 1877.

Black etching.

495.

- 1876—Irving (R. D.).** Map of Devil's Lake gorge.

Accompanying "Wisconsin geological survey." Vol. II. Part III. Plate XIX, p. 507. Madison, 1877.

Black etching.

496.

- 1876—Irving (R. D.).** Map showing the succession of layers along the gorge of the Montreal River. T. 47, R. J. E. Scale, 10 inches to the mile.

Accompanying "Wisconsin geological survey." Vol. III. Part III. Plate XIX, p. 192. Madison, 1880.

Black etching, with geological indications and numbers corresponding to text.

497.

- 1876—Irving (R. D.).** Map showing the succession of layers along the Montreal River. T. 47, R. J. E. Scale,  $2\frac{1}{2}$  inches = 1 mile.

Accompanying "Wisconsin geological survey." Vol. III. Part III. Plate XVIII, p. 190. Madison, 1880.

Black etching, with geological indications.

(95)

498.

- 1876—Strong (M.).** Grant and parts of Lafayette, Iowa, Richland, and Crawford Counties.

Accompanying "Wisconsin geological survey." Atlas, Vol. II, folio. Plate XVI. Milwaukee, 1877.

499.

- 1876—Strong (M.).** Geology and topography of the lead region.

Accompanying "Wisconsin geological survey." Atlas, Vol. II, folio. Plates III, IV, V, VI, VII. Milwaukee, 1877.

In five sheets.

500.

- 1876—Strong (M.), and Wooster (L. C.).** Polk and Barron Counties, and parts of Dunn, Saint Croix, Chippewa, and Burnett Counties, towns 32–38, inclusive, by M. Strong. Town 31, by L. C. Wooster.

Accompanying "Wisconsin geological survey." Atlas, Vol. III, folio. Plate XIX. Milwaukee, 1879.

501.

- 1876—Winchell (N. H.).** Geological map of Houston County, Minnesota.

Accompanying "Geological and Nat. Hist. Surv. of Minnesota." Fifth Annual Report, p. 9. Saint Paul, 1877.

502.

- 1876—Winchell (N. H.).** Geological map of Hennepin County, Minnesota.

Accompanying "Geological and Nat. Hist. Surv. of Minnesota." Fifth Annual Report, p. 131. Saint Paul, 1877.

503.

- 1876—Winchell (N. H.).** Map of the vicinity of the Fall of Saint Antony, intended to illustrate the surface geology (Minnesota). Scale, 1 inch to 1 mile.

Accompanying "Geological and Nat. Hist. Surv. of Minnesota." Fifth Annual Report, p. 156. Saint Paul, 1877.

504.

- 1873–1877—Irving (R. D.).** Map of part of T. 44, R. 3 W., designed to show the relations of the Laurentian, Huronian, and Keweenaw systems.

Accompanying "Wisconsin geological survey." Vol. III, Part III. Plate XV, p. 145. Madison, 1880.

505.

- 1877—Irving (R. D.).** Map showing the relative positions of the isolated Archæan areas of Wisconsin. Scale, 1 inch to 24 miles.

Accompanying "Wisconsin geological survey." Vol. II, Part III. Plate XVIII, p. 501. Madison, 1877.

Black etching.

(96)

506.

- 1877—Irving (R. D.).** Map of part of Wisconsin, designed to show the main facts with regard to the distribution of the glacial drift and other quaternary deposits.

Accompanying "Wisconsin geological survey." Vol. II, Part III. Plate XXV A, p. 608. Madison, 1877.

507.

- 1877—Irving (R. D.).** Outline of an area of Trenton limestone, near Columbus. Scale, 4 miles to the inch.

Accompanying "Wisconsin geological survey." Vol. II, Part III. p. 614. Madison, 1877.

Black etching.

508.

- 1877—Irving (R. D.).** Details of the structure of the Huronian or iron-bearing series of Ashland and Lincoln Counties. Scale, 3.6 inches = 1 mile.

Accompanying "Wisconsin geological survey." Atlas, Vol. III, folio. Plates XXIV, XXV, XXVI. Milwaukee, 1879.

In three sheets.

509.

- 1877—Sperry (L. B.).** Geological map of Rice County, Minnesota.

Accompanying "Geological and Nat. Hist. Surv. of Minnesota." Sixth Annual Report, p. 114. Minneapolis, 1878.

510.

- 1877—Sweet (E. T.).** Outline geological map of a portion of Northern Wisconsin.

Accompanying "Wisconsin geological survey." Vol. III, Part V. Plate XXXIV, p. 330. Madison, 1880.

Black etching.

511.

- 1877—Sweet (E. T.).** Outline structural map of the Lower Black River Falls. Scale 400 feet to the inch.

Accompanying "Wisconsin geological survey." Vol. III, Part V, p. 343. Madison, 1880.

Black etching and numbers corresponding to geological indications in the text.

512.

- 1877—Winchell (N. H.).** Geological map of Ramsey County, Minnesota.

Accompanying "Geological and Nat. Hist. Surv. of Minnesota." Sixth Annual Report, p. 66. Minneapolis, 1878.

(97)

Bull. 7—7

513.

- 1877—Winchell (N. H.).** Geological map of Rock and Pipestone Counties, Minnesota.

Accompanying "Geological and Nat. Hist. Surv. of Minnesota." Sixth Annual Report, p. 92. Minneapolis, 1878.  
Black, with geological inscriptions.

514.

- 1877—Wright (C. E.).** Penokie iron range west of Gap.

Accompanying "Wisconsin geological survey." Atlas, Vol. III, folio. Plate XXVII. Milwaukee, 1879.

515.

- 1878—Irving (R. D.).** Map showing the succession of layers along the Potato River. Scale, 6 inches = 1 mile.

Accompanying "Wisconsin geological survey." Vol. III, Part III, Plate XVII, p. 188. Madison, 1880.  
Black etching, with geological indications.

516.

- 1878—Irving (R. D.).** Geological map and sections illustrating the structure of the regions drained by the Bad and Montreal Rivers. Scale, 2 miles to the inch.

Accompanying "Wisconsin geological survey." Atlas, Vol. III, folio. Plate XXII. Milwaukee, 1879.

517.

- 1878—Warren (G. K.).** (No title.)

Accompanying "Valley of the Minnesota River and of the Mississippi River, to the junction of the Ohio; its origin considered." Amer. Journ. Silliman. 3rd series, Vol. XVI, Diagram E. New Haven, 1878.  
Black etching, with geological indications in the text.

518.

- 1879—Brooks (T. B.).** Sturgeon River.

Accompanying "Wisconsin geological survey." Vol. III, Part VII. Plate I, p. 452. Madison, 1880.  
Black etching, and geological indications.

519.

- 1879—Brooks (T. B.).** Big Quinnesec Falls. Scale,  $\frac{1}{2}$  mile to 1 inch.

Accompanying "Wisconsin geological survey." Vol. III, Part VII. Plate III, p. 472. Madison, 1880.  
Black etching and geological indications.

520.

- 1879—Brooks (T. B.).** Little Quinnesec Falls and Sand Portage Rapids. Scale,  $\frac{1}{4}$  of a mile to the inch.

Accompanying "Wisconsin geological survey." Vol. III, Part VII. Plate II, p. 468. Madison, 1880.  
Black etching and geological indications.

(98)

521.

- 1879—Brooks (T. B.). Twin and Four Ft. Falls, Menominee River. Scale,  $\frac{1}{4}$  of a mile to the inch.

Accompanying "Wisconsin geological survey." Vol. III, Part VII. Plate IV, p. 475. Madison, 1880.

Black etching and geological indications.

522.

- 1879—Brooks (T. B.). Pine and Poplar Rivers. Scale,  $\frac{1}{2}$  mile to the inch.

Accompanying "Wisconsin geological survey." Vol. III, Part VII. Plate V, p. 477. Madison, 1880.

Black etching and geological indications.

523.

- 1879—Brooks (T. B.). Commonwealth and Eagle iron belts. Scale,  $\frac{1}{2}$  mile to the inch.

Accompanying "Wisconsin geological survey." Vol. III, Part VII. Plate VI, p. 481. Madison, 1880.

Black etching and geological indications.

524.

- 1879—Brooks (T. B.). Hypothetical sketch of the rock structure near Lake Eliza.

Accompanying "Wisconsin geological survey." Vol. III, Part VII. Plate VIII, p. 484. Madison, 1880.

Black etching and geological indications.

525.

- 1879—Brooks (T. B.). Lower Brulé, Michigamme, and Paint Rivers. Scale,  $\frac{1}{2}$  mile to the inch.

Accompanying "Wisconsin geological survey." Vol. III, Part VII. Plate IX, p. 492. Madison, 1880.

Black etching and geological indications.

526.

- 1879—Brooks (T. B.). Geological sketch of the Menominee iron region, showing approximatively the distribution and folds, illustrating report, Vol. III, Part VII. Scale, 3 miles to the inch.

Accompanying "Wisconsin geological survey." Atlas, Vol. III, folio. Plate XXIX. Milwaukee, 1879.

527.

- 1879—Brooks (T. B.) and Wright (C. E.). Map of the Menominee iron region, including Pine River district, Oconto County, and in part the Sturgeon River district, Michigan. Scale,  $\frac{3}{4}$  inch to 1 mile.

Accompanying "Wisconsin geological survey." Atlas, Vol. III, folio. Plate XXVIII. Milwaukee, 1879.

528.

- 1879—Irving (R. D.).** Map of Wisconsin and adjoining portions of Michigan, Illinois, Iowa, and Minnesota, showing geological structure, positions of the principal mineral districts, &c. Scale 20 miles to 1 inch.

Accompanying "The mineral resources of Wisconsin." Trans. Amer. Inst. Mining Engrs., Vol. VIII, p. 506. Easton, Pa., 1880.

A well executed and very clear geological map.

529.

- 1879—Strong (M.).** Map of Northwestern Wisconsin, designed to show the main features of the surface geology.

Accompanying "Wisconsin geological survey." Vol. III, Part VI. Plate XXXVII, p. 383. Madison, 1880.

530.

- 1879—Strong (M.) and Sweet (E. T.).** Douglas County, and parts of Bayfield, Burnett, and Ashland Counties; north of township 43, by E. T. Sweet, south of township 44, by M. Strong.

Accompanying "Wisconsin geological survey." Atlas, Vol. III, folio. Plate XX. Milwaukee, 1879.

531.

- 1879—Strong (M.) Sweet (E. T.) and Irving (R. D.).** Parts of Ashland, Bayfield, and Lincoln Counties. Ashland County, the Apostle island, Lincoln County, and townships 44–51, ranges 4 and 5 west, Bayfield County, by R. D. Irving; townships 43–46, ranges 6 and 7 west, by M. Strong; township 47–51, ranges 6 and 7 west, by E. T. Sweet. Scale, 3 miles to the inch.

Accompanying "Wisconsin geological survey." Atlas, Vol. III, folio. Plate XXI. Milwaukee, 1879.

532.

- 1879—Wooster (L. C.) and Strong (M.).** Saint Croix, Chippewa, and Eau Claire Counties, T. XXV, Pepin County, and T. 27, ranges 15 to 18 W., T. 26, range 15 and 16 W., and parts of T. 25, range 15 W., and T. 26, range 17 W., Pierce County, by L. C. Wooster; Trempealeau, Buffalo, and the remainder of Pierce and Pepin, by M. Strong. Scale, 3 miles to the inch.

Accompanying "Wisconsin geological survey." Atlas, Vol. III, folio. Plate XVIII. Milwaukee, 1879.

533.

- 1879—Wright (C. E.).** Map of the Menominee iron district and adjacent territory.

Accompanying "Wisconsin geological survey." Atlas, Vol. III, folio. Plate XXX. Milwaukee, 1879.

(100)

534.

**1880—Irving (R. D.).** Quaternary map of the eastern Lake Superior district.

Accompanying "Wisconsin geological survey." Vol. III, Part III. Plate XX, p. 211. Madison, 1880.

535.

**1880—Irving (R. D.).** Outline geological map of northern Wisconsin. Scale, 15 miles to the inch.

Accompanying "Wisconsin geological survey." Vol. III, Part I. Plate IX, p. 3. Madison, 1880.

536.

**1880—Wright (E. C.).** No title. Section 16, township 44 N., range 5 W., Wisconsin.

Accompanying "Wisconsin geological survey." Vol. III, Part IV. Plate XXVII, p. 286. Madison, 1880.

Colored and with geological indications.

537.

**1881—Kloos (J. H.).** Orientirungs-Karte zu den geologischen Notizen aus Minnesota.

Accompanying "Geological and Nat. Hist. Surv. of Minnesota." Tenth Annual Report. Saint Paul, 1881.

See Kloos (J. H.), 1871—No. 469.

538.

**1881—Winchell (N. H.).** Sketch map of the canoe trail from Ogishke Muncie Lake to the mouth of Poplar River (Lake Superior).

Accompanying "Geological and Nat. Hist. Surv. of Minnesota." Tenth Annual Report, Plate I. St. Paul, 1882.

Black with geological indications.

539.

**1881—Winchell (N. H.).** Sketch map of the iron trail for canoes from Grand Marais to Iron Lake (Lake Superior).

Accompanying "Geological and Natural Hist. Surv. of Minnesota." Tenth Annual Report, Plate II. Saint Paul, 1882.

Black with geological indications.

**N. B.—Nelson Saylor,** in 1865, advertised the publication of a "Geological map of Illinois," but it was never published.



**XII.—SOUTHERN STATES, COMPRISING VIRGINIA, WEST VIRGINIA  
KENTUCKY, TENNESSEE, MISSISSIPPI, ALABAMA, FLORIDA,  
GEORGIA, SOUTH CAROLINA, AND NORTH CAROLINA.**

540.

- 1827—Mitchell (Dr.).** A geological map of the eastern half of North Carolina.

Never published, and has disappeared. Not seen.

541.

- 1833—Peck (J.).** Geological map of the mining districts in the State of Georgia, western parts of North Carolina, and in East Tennessee. Scale, 10 miles to  $\frac{1}{2}$  of an inch.

Accompanying "Geological and mineralogical account of the mining districts in the State of Georgia," etc. Amer. Jour. Silliman, Vol. XXIII. New Haven, 1833.

This map has merely geological indications on it.

542.

- 1839—Troost (Gerard).** Geological map of the State of Tennessee.

Accompanying "Fifth geological report to the general assembly of Tennessee," p. 8 Nashville, 1840.

543.

- 1839—Troost (Gerard).** Geological map of Cocke County, East Tennessee.

Accompanying "Fifth geological report to the general assembly of Tennessee," p. 22. Nashville, 1840.

Black with mineralogical indications.

544.

- 1842—Mitchell (Dr.).** Geological map of North Carolina.

Accompanying "A geological text book." (Raleigh) 1842.

A very small map. Not seen.

545.

- 1843—Troost (Gerard).** Geological map of Davidson, Williamson, and Maury Counties (Tennessee).

Accompanying "Seventh geological report to the general assembly of Tennessee." Nashville, 1844.

A very rare map.

546.

- 1845—Tuomey (Michael).** Geological map of South Carolina.

Accompanying "Report on the geology of South Carolina." 4°. Columbia, 1848.

547.

**1848—Tuomey (Michael).** Geological map of Alabama.

Accompanying "First biennial report of the geology of Alabama." Tuscaloosa, 1850.

It is the rarest geological map of the New World, only 5 or 6 copies are known to exist. I possess one given by the author to D'Archiac.

548.

**1849—White (G.).** Bonner's map of the State of Georgia, with the addition of its geological features. Scale, 20 miles to an inch.

Accompanying "Statistics of the State of Georgia." Savannah, 1849.

549.

**1851—Safford (J. M.)** The Silurian Basin of Middle Tennessee.

Accompanying "The Silurian Basin of Middle Tennessee, with notices of the strata surrounding it." Amer. Journ. Silliman, Vol. XII, Nov. 1851, p. 352. New Haven, 1851.

Black with numbers and signs.

550.

**1851—Tuomey (Michael).** Plan, or horizontal section showing the geological structure of Anthony's Creek Reservoir.

Accompanying "Report addressed to Hon. G. Y. Mason, president of the James River and Kanawha Canal Co.," November 6, 1851. (Richmond, Virginia, 1852).

Not seen.

551.

**1854—Lieber (O. M.).** Geological map of Mississippi.

Accompanying "A sketch of the geology of the State of Mississippi." The Mining Magazine, edited by W. J. Tenney. Vol. III, p. 42. New York, July, 1854.

Black etching and geological indications.

552.

**1855—Tuomey (Michael).** Geological map of the State of Alabama.

Accompanying "Second biennial report of the geology of Alabama," edited by J. W. Mallet. Montgomery, 1858.

This second edition of the geological map of Tuomey is also rare, and in some respects inferior to the first edition. The scale is smaller. Tuomey died in March, 1857, and the map was printed in New York by J. H. Colton without his supervision. However, it contains some corrections brought about by Tuomey's survey and explorations of the years 1854 and 1855. It is the first geological map colored by chromo-lithography in America.

553.

**1856—Emmons (Ebenetzer).** Map of the Deep River coal field, North Carolina.

Accompanying "Geological report of the midland counties of North Carolina." Raleigh, 1856.

(103)

554.

**1856—Lieber (O. M.).** Geognostic map of York district. Scale, 5 miles to an inch.

Accompanying "Reports on the geognostic survey of South Carolina, 1856-1860." First annual report. Plate IX. Columbia, 1856.

A second edition was published in 1858—No. 568.

555.

**1856—Lieber (O. M.).** Geognostic map of Chester district. Scale, 5 miles to an inch.

Accompanying "Reports on the geognostic survey of South Carolina, 1856-1860." First annual report. Plate VIII. Columbia, 1856.

A second edition was published in 1858—No. 569.

556.

**1856—Lieber (O. M.).** Geognostic map of Lancaster district.

Accompanying "Reports on the geognostic survey of South Carolina, 1856-1860." First annual report. Plate VII. Columbia, 1856.

A second edition was published in 1858—No. 570.

557.

**1856—Lieber (O. M.).** Geognostic map of Chesterfield district. Scale, 5 miles to an inch.

Accompanying "Reports on the geognostic survey of South Carolina, 1856-1860." First annual report. Plate VI. Columbia, 1856.

A second edition was published in 1858—No. 571.

These maps and reports are quite scarce, most of them having been burned in the fire that destroyed Columbia in 1865.

558.

**1856—Safford (J. M.).** Geological map of the State of Tennessee.

Accompanying "A geological reconnoissance of the State of Tennessee," being the author's first biennial report. Nashville, 1856.

559.

**1857—Harper (L.).** Geological chart of Mississippi.

Accompanying "Preliminary report on the geology and agriculture of the State of Mississippi." Jackson, 1857.

560.

**1857—Harper (L.).** Mississippi bottom in the State of Mississippi, or the alluvial plains of the Mississippi River in Mississippi.

Accompanying "Preliminary report on the geology and agriculture of the State of Mississippi," p. 259. Jackson, 1857.

561.

**1857—Harper (L.).** Special map of Tishamingo County.

Accompanying "Preliminary report on the geology and agriculture of the State of Mississippi." Table IV. Jackson, 1857.

562.

**1857—Harper (L.).** The prairies above Tibby Creek.

Accompanying "Preliminary report on the geology and agriculture of the State of Mississippi." Table V. Jackson, 1857.

563.

**1857—Harper (L.).** Special map of Pontotoc County.

Accompanying "Preliminary report on the geology and agriculture of the State of Mississippi." Table VI. Jackson, 1857.

564.

**1857—Harper (L.).** Special map of Tippah County.

Accompanying "Preliminary report on the geology and agriculture of the State of Mississippi." Table VII. Jackson, 1857.

565.

**1857—Lieber (O. M.).** Geognostic map of Union district. Scale, 5 miles to an inch.

Accompanying "Reports on the geognostic survey of South Carolina, 1856-1860." Second annual report. Plate XIII. Columbia, 1858.

566.

**1857—Lieber (O. M.).** Geognostic map of the itacolumite, iron, and limestone region of Union, Spartanburgh, and York district, South Carolina. Scale, 1 inch to 2 miles and 1 inch to 1 mile.

Accompanying "Reports on the geognostic survey of South Carolina, 1856-1860." Second annual report. Plate XII. Columbia, 1858.

Two maps on the same plate, with different scales.

567.

**1857—Lieber (O. M.).** Geognostic map of Spartanburgh district. Scale, 5 miles to 1 inch.

Accompanying "Reports on the geognostic survey of South Carolina, 1856-1860." Second annual report. Plate XIV. Columbia, 1858.

568.

**1858—Lieber (O. M.).** Geognostic map of York district. Scale, 5 miles to 1 inch.

Accompanying "Reports on the geognostic survey of South Carolina, 1856-1860." First annual report. Plate IX. Columbia, 1858.

Reprint of the map of 1856, which see.—No. 554.

569.

**1858—Lieber (O. M.).** Geognostic map of Chester district. Scale, 5 miles to 1 inch.

Accompanying "Reports on the geognostic survey of South Carolina, 1856-1860." First annual report. Plate VIII. Columbia, 1858.

Reprint of the map of 1856, which see.—No. 555.

(105)

570.

**1858—Lieber (O. M.).** Geognostic map of Lancaster district.

Accompanying "Reports on the geognostic survey of South Carolina, 1856-1860." First annual report. Plate VII. Columbia, 1858.

Reprint of the map of 1856, which see—No. 556.

571.

**1858—Lieber (O. M.).** Geognostic map of Chesterfield district. Scale, 5 miles to 1 inch.

Accompanying "Reports on the geognostic survey of South Carolina, 1856-1860." First annual report. Plate VI. Columbia, 1858.

Reprint of the map of 1856, which see—No. 557.

572.

**1859—Currey (R. O.).** A geological map of the copper region embraced in the counties of Floyd, Carroll, and Grayson, Va., and Ashe and Alleghany, N. C. Scale,  $6\frac{1}{4}$  miles to 1 inch.

Accompanying "The copper and iron region of the Floyd-Carroll-Grayson Plateau of the Blue Ridge in Virginia." "The Virginias," Vol. I, p. 62. 4to. Staunton, Virginia, 1880.

Black etching, with geological inscriptions.

573.

**1859—Lieber (O. M.).** Geognostic map of Greenville district. Scale, 5 miles to 1 inch.

Accompanying "Reports on the geognostic survey of South Carolina, 1856-1860." Plate XVI. Columbia, 1859.

574.

**1859—Lieber (O. M.).** Geognostic map of Pickens district. Scale, 5 miles to 1 inch.

Accompanying "Reports on the geognostic survey of South Carolina, 1856-1860." Plate XVII. Columbia, 1859.

575.

**1860—Hilgard (E. W.).** Geological map of Mississippi.

Accompanying "Report on the geology and agriculture of the State of Mississippi." Jackson, Mississippi, 1860.

576.

**1860—Lieber (O. M.).** Portion of Abbeville district around Calhoun's Mill. Scale, two and one-half miles to an inch.

Accompanying "Reports on the geognostic survey of South Carolina, 1856-1860." Plate XX. Columbia, 1860.

577.

**1860—Lieber (O. M.).** Industrial map of South Carolina. Scale, 1:1,800,000.

Accompanying "Reports on the geognostic survey of South Carolina, 1856-1860." Plate XXI. Columbia, 1860.

(106)

578.

- 1860—Lieber (O. M.).** Geognostic map of Anderson district. Scale, five miles to an inch.

Accompanying "Reports on the geognostic survey of South Carolina, 1856-1860." Plate XIX. Columbia, 1860.

579.

- 1860—Lieber (O. M.).** Geognostic map of Abbeville district.

Accompanying "Reports on the geognostic survey of South Carolina, 1856-1860." Plate XX. Columbia, 1860.

580.

- 1864—Safford (J. M.).** No title.

Accompanying "On the cretaceous and superior formations of West Tennessee." Amer. Journ. Silliman. 2d series, Vol. XXXVII, p. 362. New Haven, 1864.

Black etching, with numbers corresponding to geological indications in the text.

581.

- 1865—Saylor (Nelson).** Geological map of Kentucky. Geological formations delineated by Nelson Saylor. Scale, 5 miles to 1 inch. Cincinnati, 1865.

582.

- 1865—Saylor (Nelson).** Geological map of Tennessee. Scale, 5 miles to 1 inch. Cincinnati, 1865.

Not seen.

583.

- 1867—Lyman (B. S.).** A geological and topographical map of a rough survey of the Staley's Creek and Nick's Creek iron region near Marion, Smyth County, Virginia.

Accompanying "The Staley's Creek and Nick's Creek iron ore region." Trans. Amer. Phil. Soc. New series. 4°. Vol. XV, Article III, Plate II. Philadelphia, 1881.

Black etching, with geological indications.

584.

- 1869—Safford (J. M.).** Geological map of Tennessee. Scale, 12 miles to an inch.

Accompanying "Geology of Tennessee." Nashville, 1869.

585.

- 1870—Lesley (J. P.).** No title. Scale, 5 miles to one inch.

Accompanying "The geological structure of Tazewell, Russell, and Wise Counties, in Virginia." Proc. Amer. Phil. Soc., Vol. XII. Philadelphia, 1873.

(107)

586.

- 1871—Lesley (J. P.).** Coal beds on Russell's Creek. Scale, 480 yards to 1 inch. Contour lines, 10 feet vertical apart. Foot survey by J. P. Lesley, October, 1870, Russell County, Virginia.

Accompanying "The geological structure of Tazewell, Russell, and Wise Counties, in Virginia." Proc. Amer. Phil. Soc., Vol. XII, p. 495. Philadelphia, 1873.

Black, with lithological and mineralogical indications.

587.

- 1871—Lesley (J. P.).** Sketch map of Clinch River where it strikes the coal measures and rebounds at Lick Run.

Accompanying "The geological structure of Tazewell, Russell, and Wise Counties, in Virginia." Proc. Amer. Phil. Soc., Vol. XII, p. 497. Philadelphia, 1873.

Small black sketch, with mineralogical indications.

588.

- 1871—Lesley (J. P.).** No title. (Sketch map part of Clinch River near Middle Creek.)

Accompanying "The geological structure of Tazewell, Russell, and Wise Counties, in Virginia." Proc. Amer. Phil. Soc., Vol. XII, p. 498. Philadelphia, 1873.

Small black sketch, with mineralogical indications.

589.

- 1871—Lesley (J. P.).** No title. (Sketch map part of Clinch River above Middle Creek.)

Accompanying "The geological structure of Tazewell, Russell, and Wise Counties, in Virginia." Proc. Amer. Phil. Soc., Vol. XII, p. 502. Philadelphia, 1873.

Small black sketch, with mineralogical indications.

590.

- 1871—Lesley (J. P.).** Local map of Abb's Valley coal, properly blue stone coal. Scale, 500 feet to 1 inch.

Accompanying "The geological structure of Tazewell, Russell, and Wise Counties in Virginia." Proc. Amer. Phil. Soc., Vol. XII, p. 505. Philadelphia, 1873.

Black, with lithological inscriptions.

591.

- 1873—Lesley (Joseph, jr.).** Map of Eastern Kentucky, showing the western outcrop of its coal-field, as determined by surveys in 1858 and 1859. Scale, 12 miles to  $\frac{1}{16}$  of an inch.

Accompanying "The outcrop belt of the Eastern Kentucky coal-field." Proc. Amer. Phil. Soc., Vol. XIII, p. 270. Philadelphia, 1873.

Black etching.

See Lesley (Joseph, jr.)—No. 598.

(106)

## 592.

- 1874—Rogers (W. B.) and Hotchkiss (Jed.).** Map of Virginia, by J. Hotchkiss. The geology by Prof. W. B. Rogers, chiefly from the State survey 1835-'41, "With later observations in some parts."

Accompanying "Virginia: a geographical and political summary," &c., p. 46. Richmond, 1876.

This map, with some additions, also appeared with the title: "**Hotchkiss's** geological map of Virginia and West Virginia. The geology by Prof. W. B. Rogers, chiefly from the Virginia State survey 1835-1841, with later observations in some parts." Scale, 1:1,520,640, or 24 miles to one inch. Accompanying "Preliminary report concerning the resources of the country adjacent to the line of the proposed Richmond and Southwestern Railway," by N. S. Shaler, Cambridge, 1880, and also in the "Virginias," Vol. I, No. 6, p. 92. Staunton, Va., 1880—No. 611.

## 593.

- 1875—Kerr (W. C.).** Geological map of North Carolina.

Accompanying "Report of the geological survey of North Carolina," Vol. I. Raleigh, 1875.

## 594.

- 1875—Shaler (N. S.).** Kentucky geological survey; preliminary map.

Accompanying "Report of progress," Vol. II. New series. Frankfort, 1877.

Black etching.

See Shaler (N. S.)—Nos. 596, 599, 600, 613.

## 595.

- 1875—Stevenson (J. J.).** Sketch map to illustrate notes on the geology of West Virginia.

Accompanying "Notes on the geology of West Virginia." Proc. Amer. Phil. Soc., Vol. XIV, p. 370. Philadelphia, 1876.

Black; the double dotted line represents the eastern outcrop of the Pittsburgh coal.

## 596.

- 1876—Shaler (N. S.)** Kentucky geological survey. Preliminary map.

Accompanying "A general account of the commonwealth of Kentucky." Frankfort, 1876.

This pamphlet was compiled for distribution at the Centennial Exposition; a thousand copies of the map colored were issued, and later some additional copies with the map in black etching.

See Shaler (N. S.)—Nos. 594, 599, 600, 613.

## 597.

- 1876—Smith (E. A.).** Map showing the Southwest termination of the Coosa coal field.

Accompanying "Geological survey of Alabama." Report of progress for 1876. Montgomery, Ala., 1876.

Black etching.



598.

- 1877—**Lesley** (Joseph, jr.). Map of Eastern Kentucky, showing the western outcrop of its coal field as determined by surveys of 1858 and 1859.

Accompanying "Geological survey of Kentucky," Vol. III. New series. Frankfort, 1877.

See **Lesley** (Joseph, jr.)—No. 591.

599.

- 1877—**Shaler** (N. S.). Kentucky geological survey. Preliminary map.

Accompanying "The report of the Kentucky commissioner of agriculture for 1877." Frankfort, 1877.

Black etching. This is the map already mentioned published in various reports in colors or black etching.

See **Shaler** (N. S.) 1875, 76-1880—Nos. 594, 596, 600, 613.

600.

- 1877—**Shaler** (N. S.). Kentucky geological survey, preliminary map compiled from various surveys.

Accompanying "Geological survey of Kentucky," Vol. III. New series. Frankfort, 1877.

It appeared also in "Preliminary report concerning the resources of the country adjacent to the line of the proposed Richmond and Southwestern Railway," by N. S. **Shaler**. Cambridge, 1880.

See **Shaler** (N. S.)—Nos. 594, 596, 599, 613.

601.

- 1878—**Heinrich** (O. J.). Map of the eastern part of the State of Virginia. Scale, 20 miles to 1 inch.

Accompanying "The mesozoic formation in Virginia." Trans. Amer. Inst. Mining Engrs., Vol. VI. Plate V. Easton, Pa., 1879.

Black etching and signs. The map and memoir have been reprinted in "The Virginias" of Major Jed. **Hotchkiss**, Vol. I., No. 8, pages 124 and 125. Staunton, Va., August, 1880.

602.

- 1878—**Smith** (E. A.). Geological map of Alabama, prepared for Berney's Hand-book of Alabama.

Accompanying "Hand-book of Alabama." A complete index to the State, with a geological map and an appendix of useful tables, by Saffold Berney. Mobile, 1878.

603.

- 1878—**Smith** (E. A.). Geological map of Marion County (Alabama). Scale, 4 miles to 1 inch.

Accompanying "Geological survey of Alabama." Report of progress for 1877 and 1878, p. 120. Montgomery, 1879.

604.

- 1878—**Smith** (E. A.). Geological map of Walker County (Alabama). Scale, 4 miles to 1 inch.

Accompanying "Geological survey of Alabama." Report of progress for 1877 and 1878, p. 82. Montgomery, 1879.

(110)

605.

- 1878—**Smith (E. A.).** Geological map of Winston County (Alabama).  
Scale, 4 miles to 1 inch.

Accompanying "Geological survey of Alabama." Report of progress for  
1877 and 1878, p. 97. Montgomery, 1879.

606.

- 1878—**Smith (A. E.).** Geological map of Fayette County (Alabama).  
Scale, 4 miles to 1 inch.

Accompanying "Geological survey of Alabama." Report of progress for  
1877 and 1878, p. 105. Montgomery, 1879.

607.

- 1879—**Smith (E. A.).** Map of the Black Warrior River from Tuscaloosa  
to the fork of Sipsey and Mulberry. Scale, 2 miles to 1 inch.

Accompanying "Geological survey of Alabama." Report of progress for  
1879 and 1880. Montgomery, 1881.

608.

- 1880—**Hotchkiss (Jed.).** Map of the great Ohio Coal Basin, compiled  
from State geological surveys.

Accompanying "The coal fields of West Virginia and Virginia in the Great  
Ohio or Trans-Appalachian Coal Basin." "The Virginias." Vol. I, 4°, p. 188.  
Staunton, Virginia, 1880.

609.

- 1880—**Stevenson (J. J.).** Geological map of parts of Lee, Wise, Scott,  
and Washington Counties, Virginia. Scale, 5 miles to 1 inch.

Accompanying "A geological reconnaissance of parts of Lee, Wise, &c.  
Counties." Proc. Amer. Phil. Soc., Vol. XIX. No. 108, p. 219. Philadelphia,  
1881.

The map and memoir have been reproduced in "The Virginias," Vol. II, p.  
22. February, 1881. 4°. Staunton, Virginia, 1881.

610.

- 1880—**Heinrich (O. J.).** Map of the eastern part of the State of Virginia.  
Scale, 20 miles to 1 inch.

Accompanying "The Virginias," Vol. I, No. 8, pp. 124 and 125. Staunton,  
1880.

See **Heinrich (O. J.),** 1878—No. 601.

611.

- 1880—**Rogers (W. B.).** Hotchkiss' geological map of Virginia and West  
Virginia. The geology by Prof. W. B. Rogers, chiefly from the  
Virginia State survey 1835–1841, with later observations in some  
parts. Scale, 1:1,520,640, or 24 miles to 1 inch.

Accompanying "Preliminary report concerning the resources of the coun-  
try adjacent to the line of the proposed Richmond and Southwestern Rail-  
way," by N. S. Shaler. Cambridge, 1880.

See **Rogers (W. B.),** 1874—Nos. 592, 612.

(111)

598.

- 1877—**Lesley** (Joseph, jr.). Map of Eastern outcrop of its coal "and 1859. Staunton, 1880.

Accompanying "Frankfort, 1877.

See **Lesley** (.)

- 1877—**Shaler** (N)

Accor  
for 187

B)

po

Accompanying geological survey, preliminary map  
of the proposed Richmond and Southwestern Railway,"  
Cambridge, 1880.  
Nos. 594, 596, 599, 600.  
Shaler (N. S.), 1877—

614.

- 187

1881—**Hutchins** (Jed.). Centennial geological map of the Virginias.  
The geology that of the Virginia State survey, by Prof. W. B.  
Rogers, 1881-41, corrected by later observers. Scale, 3½ miles to  
1 inch. Staunton, Va., 1881.  
A very large wall map in 14 sheets.

615.

- 1881—**Smith** (E. A.). Geological map of Florida.

Accompanying "On the geology of Florida." Amer. Journ. Silliman, 3d  
series, Vol. XXI, p. 305. New Haven, 1-81.  
In black etching, with geological indications.

616.

- 1881—**Stevenson** (J. J.). Geological map of parts of Lee, Wise, Scott,  
and Washington Counties, Virginia. Scale, 5 miles to the inch.

Accompanying "A geological reconnaissance of parts of Lee, Wise, &c." The  
Virginias. Vol. II, p. 22, February number, 4°. Staunton, 1881.

See **Stevenson** (J. J.), 1880—No. 609.

(112)

**XIII.—NORTHWESTERN STATES AND TERRITORIES, COMPRISING  
NEBRASKA, DAKOTA, WYOMING, MONTANA, NATIONAL  
PARK, AND IDAHO.**

617.

- 1852—Evans (John).** Map showing the positions of the Bad Lands or Mauvaises Terres of Nebraska.

Accompanying "The ancient fauna of Nebraska," by Joseph Leidy, in Smithsonian contribution to knowledge, Vol. VI. 4°. Washington, 1852.

Black, with geological indications. It also appeared in illustrations of the geological survey of Wisconsin, Iowa, and Minnesota, by D. D. Owen. 4to. Philadelphia, 1852.

See Evans (John), 1852—No. 618.

618.

- 1852—Evans (John).** Map showing the position of the Bad Lands or Mauvaises Terres of Nebraska.

Accompanying "Report of a geological survey of Wisconsin, Iowa, and Minnesota, and incidentally of a portion of Nebraska Territory," by D. D. Owen, Vol. of illustrations. 4°. Philadelphia, 1852.

Black, with geological indications; the same as the map cited above.

See Evans (John), 1852—No. 617.

619.

- 1857—Hayden (F. V.).** Geology. Map of Nebraska.

Accompanying "Notes explanatory of a map and section illustrating the geological structure of the country bordering on the Missouri River, from the mouth of the Platte River to Fort Benton." Proc. Acad. Nat. Sciences, May, 1857. Philadelphia, 1857.

620.

- 1858—Hayden (F. V.).** Geology. Map of Nebraska.

Accompanying "Explanations of a second edition of a geological map of Nebraska and Kansas," based upon information obtained in an expedition to the Black Hills, under the command of G. K. Warren. Proc. Acad. Nat. Sciences, June, 1858. Philadelphia, 1858.

Important geological map for the Upper Missouri region. Reprinted in black etching, in Petermann's Geographische Mittheilungen. 4°, Vol. VI, p. 53. Gotha. 1860.

(113)

Bull. 7—8

621.

**1859—Hayden (F. V.).** No title.

Accompanying "Geological sketch of the estuary and fresh water deposit of the bad lands of the Judith River." Trans. Amer. Phil. Soc. 4°. Vol. XI. New series, article XII. Plate VIII, p. 154. Philadelphia, 1860.

Outline map, with geological indications, of the Upper Missouri River region around Fort Benton.

622.

**1860—Hayden (F. V.).** Geologische Skizze der Black Hills, nach Hayden's Karte von A. Peterman. Scale, 1:6,500,000.

Accompanying "Petermann's Geographische Mittheilungen." 4°. Vol. VI, p. 53. Gotha, 1860.

Black etching.

See **Hayden (F. V.)**, 1858—No. 620.

623.

**1862—Hayden (F. V.).** Outline reduction of the maps of Kansas, Nebraska, and Dakota. Geology.

Accompanying "On the geology and natural history of the Upper Missouri." Being the substance of a report made to Lieut. G. K. Warren. Trans. Amer. Phil. Soc. Vol. XII. 4to. Philadelphia, 1862.

624.

**1863—Marcou (Jules).** Carte géologique de la partie des bords du Missouri entre Omaha City et Sioux City, relevée en 1863.

Accompanying "Le terrain crétacé des environs de Sioux City, de la Mission des Omahas et de Tekama sur les bords du Missouri." Bull. Soc. Géol. France, 2<sup>e</sup> série. Vol. XXIV, p. 56. Paris, 1866.

Black etching.

625.

**1863—Marcou (Jules).** Carte géologique d'une partie de Nébraska; relevée en 1863.

Accompanying "Le Dyas au Nébraska," in Bull. Soc. Géol. France, 2<sup>e</sup> série. Vol. XXIV, p. 280. Paris, 1867.

Black etching.

626.

**1867—Hayden (F. V.).** Map of Nebraska and Dakota. Scale, 19 miles to inch.?

Accompanying "On the geology of the tertiary formations of Dakota and Nebraska." Journ. Acad. Nat. Sciences, 2d series, Vol. VII. Philadelphia, 1869.

627.

**1869—Hayden (F. V.).** Map of the Yellowstone and Missouri Rivers and their tributaries explored by Capt. W. F. Reynolds and Lieut. H. E. Maynadier, 1859, 1860. Scale, 1:1,200,000. Prepared to accompany the Geological Report of F. V. Hayden, M. D., Geologist to the Expedition.

Accompanying "Geological report of the exploration of the Yellowstone and Missouri rivers" by Dr. F. V. Hayden, assistant. Washington, 1869.

(114)

628.

- 1872—Hayden (F. V.). Map of Nebraska and Dakota, and portions of the States and Territories bordering thereon, compiled by G. K. Warren. Geology by F. V. Hayden. Scale, 1:1,200,000.

Accompanying "Final report of the U. S. geological survey of Nebraska." Washington, 1872.

There is an error in the coloring by a transfer of the colors used for the granitic and metamorphic to the Potsdam sandstone and *vice versa*.

629.

- 1872—Hayden (F. V.) and Peale (A. C.). Montana and Wyoming Territories, embracing most of the country drained by the Madison, Gallatin, and Upper Yellowstone River. Scale, four miles to an inch.

U. S. Geol. Surv. of the Territories. folio. (Washington, 1872.)

No place of publication nor date.

630.

- 1872—Hayden (F. V.) and Bradley (F. H.). Map of the sources of Snake River with its tributaries, together with portions of the headwaters of the Madison and Yellowstone. Scale, five miles to one inch.

U. S. Geol. Surv. of the Territories. folio. (Washington, 1872.)

No place of publication nor date.

631.

- 1874—Comstock (T. B.). Geological map of Western Wyoming, explored in 1873 by Capt. W. A. Jones. Scale, 1:600,000.

Accompanying "Report upon the reconnaissance of Northwestern Wyoming, including Yellowstone National Park, made in the summer of 1873." Washington, 1875.

632.

- 1875—Winchell (N. H.). A geological map of the Black Hills. Scale, 6 miles to 1 inch.

Accompanying "Report of a reconnaissance of the Black Hills of Dakota, made in the summer of 1874," by Capt. William Ludlow. 4to. Washington, 1875.

633.

- 1876—Dana (E. S.) and Bird (G. G.). No title. (Out representing the vicinity of Camp Baker, Upper Missouri.)

Accompanying "Report of a reconnaissance from Carroll, Montana Territory, on the Upper Missouri, to the Yellowstone National Park, and return, made in the summer of 1875," by Capt. William Ludlow. Geological Report, p. 115, Fig. 9. 4to. Washington, 1876.

Black, with geological indications.

(115)

634.

- 1878—Dana (E. S.) and Bird (G. G.).** No title. (Sketch of Little Rocky Mountains).

Accompanying "Report of a reconnaissance from Carroll, Montana Territory, on the Upper Missouri, to the Yellowstone National Park, and return, in the summer of 1875," by Capt. William Ludlow. Geological Report, p. 129, Fig. 14. 4to. Washington, 1876.

635.

- 1876—King (Clarence).** Geological series. Map I. Rocky Mountains, Wyoming Territory, east half, west half. Scale, four miles to one inch.

Accompanying "Geological exploration of the fortieth parallel." Geological and topographical atlas, folio. New York, 1876.

In two sheets.

636.

- 1876—King (Clarence).** Geological series. Map II. Green River Basin, Wyoming Territory. Scale, four miles to one inch.

Accompanying "Geological exploration of the fortieth parallel." Geological and topographical atlas, folio. New York, 1876.

In two sheets.

637.

- 1879—Newton (Henry).** Geological map of the Black Hills of Dakota. Scale, 1 inch to 4 miles.

Accompanying "Report on the geology and resources of the Black Hills of Dakota." Topographical and geological atlas, folio. New York, 1879.

It is marked "Field work, 1875," and "Publication, 1879." Besides, the 4to volume of the report is marked "Washington, 1880." In fact, both atlas and volume did not appear and were not distributed to the public until 1881. Such discrepancies of date exist also for Clarence King's report and atlas, J. W. Powell's report and atlas, and F. V. Hayden's report and atlas.

(116)

**XIV.—NORTHWEST TERRITORIES OF THE BRITISH POSSESSIONS,  
COMPRISING MANITOBA, HUDSON'S BAY COMPANY TER-  
RITORY, SASKATCHEWAN RIVER OR ASSINNIBOINIA,  
BRITISH COLUMBIA, VANCOUVER AND QUEEN CHAR-  
LOTTE ISLANDS.**

638.

**1852—Bigsby (J. J.).** Geological map of the Lake of the Woods, South Hudson's Bay.

Accompanying "On the geology of the Lake of the Woods, South Hudson's Bay." Journ. Geol. Soc. London, Vol. VIII, p. 400. London, 1852.

Black etching.

639.

**1854—Bigsby (J. J.).** Geological map of Rainy Lake.

Accompanying "On the geology of Rainy Lake, South Hudson's Bay." Journ. Geol. Soc. London, Vol. X, p. 215. London, 1854.

Black etching.

640.

**1857—Devine (Thomas).** Map of the northwest part of Canada, Indian Territory, and Hudson's Bay. Scale, English miles, 69–160 one degree. Toronto, 1857.

In four sheets.

641.

**1859—Hector (James).** Map of Winipeg Lake Basin. Showing the distribution of superficial deposits.

Accompanying "First general report on the geology of the country examined by the expedition under the command of John Palliser, esq., during the season of 1857." Map 8. In papers relative to the exploration of British North America. Blue Book. 4°. London, 1859.

642.

**1860—Hind (H. Y.).** Geological map of a part of Rupert's Land.

Accompanying "Narrative of the Canadian Red River exploring expedition of 1857, and of the Assiniboine and Saskatchewan exploring expedition of 1858;" in two volumes. Vol. II, p. 239. London, 1860.

643.

**1860—Hind (H. Y.).** Geological map of a portion of Rupert's Land.

Accompanying "Reports of progress on the Assiniboine and Saskatchewan exploring expedition." 4°. Blue Book. Toronto, 1859, and London, 1860.

The Toronto edition is on a much larger scale than the London one.

644.

**1860—Nicol (C. S.) and Hector (James).** Plan of Nanaimo, showing the coal mines. Scale, 1 furlong to  $\frac{1}{4}$  inch.

Accompanying "Reports of Captain Palliser's exploration of that portion of British North America which in latitude lies between the British boundary line and the height of land or watershed of the northern or frozen ocean, respectively, and in longitude between the western shore of Lake Superior and the Pacific Ocean, during the years 1857-'58-'59, and '60." Index and maps. Blue Book. 4°. London, 1865.



645.

- 1861—Hector (James). Geological map of the country between Lake Superior and Vancouver Island.

Accompanying "On the geology of the country between Lake Superior and the Pacific Ocean, visited by the Government exploring expedition under the command of Capt. J. Palliser, 1857-1860." Journ. Geol. Soc., London, Vol. XVII. Plate XIII, p. 388. London, 1861.

Black etching, an important map; on the same plate there is also a geological sketch map of Nanaimo, Vancouver Island.

646.

- 1861—Hector (James). Geological sketch map of Nanaimo, Vancouver Island.

Accompanying "On the geology of the country between Lake Superior and the Pacific Ocean, visited by the Government exploring expedition under the command of Capt. J. Palliser, 1857-1860." Journ. Geol. Soc., London, Vol. XVII. Plate XIII, p. 388. London, 1861.

Black etching, on the same sheet as the map above it, which see.

See Hector (James), 1861—No. 645.

647.

- 1865—Hector (James). Geological sketch map of Nanaimo, in Vancouver Island. Scale, 1 inch to 1 mile.

Accompanying "Reports of Captain Palliser's exploration of that portion of British North America, which in latitude lies between the British boundary line and the height of land or watershed of the northern or frozen ocean, respectively, and in longitude between the western shore of Lake Superior and the Pacific Ocean, during the years 1857-'58-'59, and '60," &c. Index and maps. Blue Book. 4°. London, 1865.

648.

- 1865—Hector (James). Geological sketch of the southeast of Vancouver Island and part of the coast of the Gulf of Georgia.

Accompanying "Reports of Captain Palliser's exploration of that portion of British North America which in latitude lies between the British boundary line and the height of land or watershed of the northern or frozen ocean, respectively, and in longitude between the western shore of Lake Superior and the Pacific Ocean, during the years 1857-'58-'59, and '60." Index and maps. Blue Book. 4°. London, 1865.

649.

- 1869—Macfarlane (Thomas). Lithological map of Wood's location. Scale, 2,000 feet to 1 inch.

Accompanying "On the geology and silver ore of Wood's location, Thunder Cape, Lake Superior." The Canadian Naturalist and Geologist. New series, Vol. IV, p. 377. Montreal, 1869.

650.

- 1871—Richardson (James). Map showing the position of the coal fields of Nanaimo and Comox, Vancouver Island. Scale, 10 miles to 1 inch.

Accompanying Geol. Surv. Canada; report of progress for 1871-'72; "Report on the coal fields of the east coast of Vancouver Island," p. 100. Montreal, 1872. Black etching.

651.

- 1872—Richardson (James). Map of a part of the Strait of Georgia and of Vancouver Island, showing a portion of the Comox coal field and the distribution of the Cretaceous coal-bearing rocks. Scale, 2 miles to 1 inch.

Accompanying Geol. Surv. Canada; report of progress for 1872-'73; "Report on the coal fields of Vancouver and Queen Charlotte Islands," p. 64. Montreal, 1873.

Black etching.

652.

- 1874—Selwyn (A. R. C.). Sketch survey of the Saskatchewan River from Rocky Mountain House to Cumberland Lake. Scale, 16 miles to 1 inch.

Accompanying Geol. Surv. Canada; report of progress for 1873-'74; "Observations in the Northwest Territory on a journey across the plains from Fort Garry to Rocky Mountain House, returning by the Saskatchewan River and Lake Winnipeg," 1873, p. 17. Montreal, 1874.

Black, with geological indications.

653.

- 1875—Dawson (G. M.). Map of part of the interior region of North America, showing the general character of the drift.

Accompanying "On the superficial geology of the central region of North America." Journ. Geol. Soc., London, Vol. XXXI, p. 623. London, 1875.

Black etching.

654.

- 1875—Dawson (G. M.). General geological map of the country in the vicinity of the forty-ninth parallel.

Accompanying British North American boundary commission. "Report on the geology and resources of the region in the vicinity of the forty-ninth parallel, from the Lake of the Woods to the Rocky Mountains." Montreal, 1875.

655.

- 1875—Dawson (G. M.). Geological map of the Lake of the Woods.

Accompanying British North American Boundary Commission. "Report on the geology and resources of the region in the vicinity of the forty-ninth parallel." Montreal, 1875.

656.

- 1875—Dawson (G. M.). Geological sketch map of the vicinity of Bay Portage, Lake of the Woods.

Accompanying British North American Boundary Commission. "Report on the geology and resources of the region in the vicinity of the forty-ninth parallel." Plate II, p. 46. Montreal, 1875.

Black etching.

(119)

657.

**1875—Nicholson (H. A.).** Sketch map of Lake Superior, &c.

Accompanying "On the mining districts on the north shore of Lake Superior." Trans. North of England Inst. Mining Engrs., Vol. XXIV, Plate XL. Newcastle-upon-Tyne, 1875.

658.

**1876—Dawson (G. M.).** Geological map of a portion of British Columbia between the Fraser River and the coast range.

Accompanying Geol. Surv. Canada; report of progress for 1876-77; "Report on explorations in British Columbia, chiefly in the basin of the Blackwater, Salmon, and Nechacco Rivers, and on Francois Lake," p. 17. Montreal, 1878.

659.

**1877—Bell (Robert).** Map of part of the east coast of Hudson's Bay. Scale, 4 miles to 1 inch.

Accompanying Geol. Surv. Canada; report of progress for 1877-78; "Report on an exploration of the east coast of Hudson's Bay." Atlas. Montreal, 1879. Black, with geological indications.

660.

**1877—Richardson (James).** Map of a portion of British Columbia, showing the coal fields of Comox, Nanaimo, and Cowichin, on Vancouver and adjacent islands, and the distribution of the Cretaceous coal-bearing rocks, also the Tertiary rocks of Sooke and Burrard inlet.

Accompanying Geol. Surv. Canada; report of progress for 1876-77; "Report on the coal fields of Nanaimo, Comox, Cowichin, Burrard Inlet, and Sooke, British Columbia," p. 192. Montreal, 1878.

661.

**1877—Selwyn (A. R. C.).** Sketch survey of route from Quesnel mouth, by Stewart and MacLeod's Lakes, to the junction of Smoky River and Peace River.

Accompanying Geol. Surv. Canada; report of progress for 1875-76; "Report on exploration in British Columbia in 1875," p. 1. Montreal, 1877. Black, with geological indications.

662.

**1878—Bell (Robert).** Map of Nelson River and the boat-route between Lake Winnipeg and Hudson's Bay, and map of Lake Winnipeg. Scale, 8 miles to 1 inch.

Accompanying Geol. Surv. Canada; report of progress for 1877-78; "Report on the country between Lake Winnipeg and Hudson's Bay, 1878." Atlas, Montreal, 1879. •

Black, with geological indications; in two sheets.

(120)

663.

**1878—Dawson (G. M.).** Map of the Queen Charlotte Islands. Scale 1 : 506,880.

Accompanying Geol. Surv. Canada; report of progress for 1878-79; "Report on the Queen Charlotte Islands." Montreal, 1880.

Also in "Petermann's Geographische Mittheilungen." 4to. Vol. XXVII, 1881. Plate XVI. Gotha, 1881.

See Dawson (G. M.), 1881—No. 667.

664.

**1878—Richardson (James) and Dawson (G. M.).** Geological map of Skidegate Inlet, Queen Charlotte Islands.

Accompanying: Geol. Surv. Canada; report of progress for 1878-79. "Report on the Queen Charlotte Islands;" p. 63, B. Montreal, 1880.

The part, by J. Richardson, was surveyed in 1872.

665.

**1879—Bell (Robert).** Map of Island and God's Lakes, and of the connecting waters to Oxford Lake. Scale, 4 miles to 1 inch.

Accompanying Geol. Surv. Canada; report of progress for 1878-79. "Report on explorations on the Churchill and Nelson Rivers and around God's and Island Lakes." Montreal, 1880.

Black, with geological indications.

666.

**1880—Dawson (G. M.).** Map of part of British Columbia and the north-west territory from the Pacific Ocean to Fort Edmonton. Scale, 1 : 506,880.

Accompanying Geol. Surv. Canada; report of progress for 1879-80. "Report on an exploration from Port Simpson on the Pacific coast, to Edmonton on the Saskatchewan, embracing a portion of the northern part of British Columbia, and the Peace River country." Atlas. Montreal, 1881.

Black, with geological indications, in three sheets.

667.

**1881—Dawson (G. M.).** Geologische Karte der Queen Charlotte Islands. Scale, 1 : 1,100,000.

Accompanying "Petermann's Geographische Mittheilungen." 4°. Vol. XXVII. Plate XVI. Gotha, 1881.

See Dawson (G. M.), 1878—No. 663.

668.

**1881—Dawson (G. M.).** Geological sketch map of British Columbia. Scale, 100 miles to  $\frac{1}{2}$  inch.

Accompanying "Sketch of the geology of British Columbia." The Geological Magazine, Vol. VIII, 2d series, p. 160. London, 1881.

Black etching.

(121)

**XV.—PACIFIC STATES AND TERRITORIES, COMPRISING ALASKA,  
WASHINGTON, OREGON, AND CALIFORNIA.**

669.

- 1849—Grewingk (C.).** Karte zur Abhandlung über die Geogn. u. orogr. Beschaffenheit der N. W.-Küste Amerika's, u. der anliegenden Inseln mit Zugrundelegung der Karten des Hydrogr. Dep. des See-Ministeriums zu St. Petersburg.

Accompanying "Beitrag zur Kenntniss der orographischen und geognostischen Beschaffenheit der Nord-West-Küste Amerika's, mit den anliegenden Inseln." Verhandlungen der Russisch-Kaiserlichen Mineralogischen Gesellschaft zu St. Petersburg. Jahrgang, 1848 und 1849, p. 76. Plate II. St. Petersburg, 1850.

Grewingk did not visit Alaska, but constructed the geological map and wrote his memoir from notes taken on the spot by Ilia Wosnesensky, zoölogist of the Museum der Academie der Wissenschaften in St. Petersburg.

670.

- 1850—Tyson (P. T.).** Geological reconnaissance in California.

Accompanying "Report of P. T. Tyson upon the geology of California." Washington, 1850.

Black, with mineralogical indications.

671.

- 1853—Blake (W. P.).** Geological map of the vicinity of San Francisco.

Accompanying "Reports of explorations and surveys for a Railroad route from the Mississippi River to the Pacific Ocean." Vol. V, p. 145. 4°. Washington, 1856.

This map should more exactly be called a mineralogical map.

672.

- 1855—Blake (W. P.).** Geological map of the entrance to San Francisco Bay. Scale, 1:150,000.

Accompanying "Physical geography and geology of the coast of California, from Bodega Bay to San Diego." In Report of the Superintendent of the Coast Survey during the year 1855; 4°. p. 376. Washington, 1856.

Black etching.

673.

- 1855—Blake (W. P.).** Geological map and section of Punta de Los Reyes. Scale, 1:150,000.

Accompanying "Physical geography and geology of the coast of California, from Bodega Bay to San Diego." In Report of the Superintendent of the Coast Survey during the year 1855; 4°. p. 376. Washington, 1856.

Black etching.

674.

**1855—Blake (W. P.).** Geological map of San Diego and the adjoining coast. Scale, 1:608,228.

Accompanying "Physical geography and geology of the coast of California, from Bodega Bay to San Diego." In Report of the Superintendent of the U. S. Coast Survey during the year 1855; 4°. p. 376. Washington, 1856.  
Black etching.

675.

**1855—Blake (W. P.).** Geological map of Point Pinos, and Monterey Bay. Scale, 1:150,000.

Accompanying "Physical geography and geology of the coast of California, from Bodega Bay to San Diego." In Report of the Superintendent of the Coast Survey during the year 1855; in 4°. p. 376. Washington, 1856.  
Black etching.

676.

**1855—Blake (W. P.).** Geological map of the country between San Diego and the Colorado River, California. Scale, 1:608,228.

Accompanying "Reports of explorations and surveys for a Railroad route from the Mississippi River to the Pacific Ocean." Vol. V. p. 228. 4°. Washington, 1856.

677.

**1856—Antisell (Thomas).** Geological plan of the Coast Range of California from San Francisco Bay to Los Angeles, explored in 1855-'56 by Lieut. John G. Parke. Scale, 1:1,570,640, or 24 miles to 1 inch.

Accompanying "Reports of explorations and surveys for a Railroad route from the Mississippi River to the Pacific Ocean." Vol. VII. p. 266. 4°. Washington, 1857.

678.

**1856—Blake (W. P.).** Geological map of a part of the State of California explored in 1853 by Lieut. R. S. Williamson.

Accompanying "Reports of explorations and surveys for a Railroad route from the Mississippi River to the Pacific Ocean." Vol. V. 4°. Washington, 1856.

679.

**1856—Blake (W. P.).** Geological map of the Tejon Pass and Cañada de las Uvas and the vicinity. Including the Pass of San Francisquito and Williamson's Pass.

Accompanying "Reports of explorations and surveys for a Railroad route from the Mississippi River to the Pacific Ocean." Vol. V. p. 197. 4°. Washington, 1856.

(123)

680.

**1861—Rémond (A.).** [Auguste Rémond de Corbineau.] No title.

Accompanying "Report of an exploration and survey of the coal mines of Monte Diablo district" (California.) San Francisco, 1861.

Small sketch map in black showing tertiary hills.

681.

**1873—Bowman (A.), Pettée (W. H.), and Goodyear (W. A.).** Map of the Tertiary auriferous gravel deposits lying between the middle fork of the American and the middle Yuba rivers. Scale, 1 mile to the inch.

Accompanying "The auriferous gravels of the Sierra Nevada of California," by J. D. Whitney. In Mem. Mus. Comp. Zool. at Cambridge, Mass. Vol. VI. No. 1 (1st part) and (2nd part). 4°. Cambridge, 1880.

In two sheets. East half, corrected and revised, to replace the copy of the same sheet given in Part I. So the book contains two copies of the East half sheet.

It is not exactly a geological map, showing only the "volcanic overflows." The other indications are purely economical. These remarks apply to the other auriferous gravels maps by J. D. Whitney.

682.

**1875—Marcou (Jules).** Carte géologique de la Californie, 1854-1875.

Scale  $\frac{1}{250,000}$ .

Accompanying "Note sur la Géologie de la Californie." Bull. Soc. Géol. France, 3<sup>me</sup> série, Tome XI, Plate XI, p. 407. Paris, 1883.

The publication of this map was unavoidably delayed.

683.

**1876—Hendel (C. W.).** Map of the region near Gibsonville. Scale, 1,200 feet to the inch.

Accompanying "The auriferous gravels of the Sierra Nevada of California," by J. D. Whitney. Mem. Mus. Comp. Zool. at Cambridge, Mass. Vol. VI. 4°. No. 1. Plate T, p. 450. Cambridge, 1880.

684.

**1877—Bowie (A. J., jr.).** Surroundings of River Tunnel, Mariposa estate, 1877, California.

Accompanying "Hydraulic mining in California." Trans. Amer. Inst. Mining Engrs. Vol. VI, Plate I, Fig. 6. Easton, Pa., 1879.

Black etching and lithological indications.

685.

**1877—Bowie (A. J., jr.).** Map of "River Tunnel" on Mariposa estate, showing the course of vein and workings up to Aug. 5, 1877.

Accompanying "Hydraulic mining in California." Trans. Amer. Inst. Mining Engrs. Vol. VI, Plate I, Fig. 1. Easton, Pa., 1879.

Black etching, and lithological indications.

(124)

686.

- 1879—Pettee (W. H.) and Bowman (A.). Map showing the extent of the hydraulic mining operations near Gold Run, Dutch Flat, Little York, You Bet, Chalk Bluffs, Red Dog, Hunt's Hill, and Quaker Hill, on Bear River and Cañon, Steep Hollow, and Greenhorn Creeks. Scale, 4 inches to 1 mile.

Accompanying "The auriferous gravels of the Sierra Nevada of California," by J. D. Whitney. In Mem. Mus. Comp. Zool. at Cambridge, Mass. Vol. VI. 4°. No. 1. Cambridge, 1880.

687.

- 1880—Bowman (A.). Map of the Smartsville gravels. Scale, 1 mile to 7 inches.

Accompanying "The auriferous gravels of the Sierra Nevada, of California," by J. D. Whitney. In Mem. Comp. Zool. at Cambridge, Mass. Vol. VI. 4°. No. 1. Plate M., p. 380. Cambridge, 1880.

688.

- 1880—Whitney (J. D.). Diagram showing the position of the Table Mountain lava flow of Tuolumne County. Scale, 2 miles to the inch.

Accompanying "The auriferous gravels of the Sierra Nevada of California." In Mem. Mus. Comp. Zool. at Cambridge, Mass. Vol. VI. 4°. No. 1. Plate D, p. 132. Cambridge, 1880.

689.

- 1880—Whitney (J. D.). Plan of Spanish Peak gravel deposit.

Accompanying "The auriferous gravels of the Sierra Nevada of California." In Mem. Mus. Comp. Zool. at Cambridge, Mass. Vol. VI. 4°. No. 1. Plate K, p. 216. Cambridge, 1880.  
Black, with lithological inscriptions.

690.

- 1880—Whitney (J. D.). Map of the mining district adjacent to Forest City. Scale, 1 mile to the inch.

Accompanying "The auriferous gravels of the Sierra Nevada of California." In Mem. Mus. Comp. Zool. at Cambridge, Mass. Vol. VI. 4°. No. 1. Plate Q, p. 432. Cambridge, 1880.

691.

- 1880—Whitney (J. D.). Map to accompany the description of a portion of the region drained by Slate, Cañon, and Goodyear Creeks in Sierra and Plumas Counties. Scale, 2 miles to 1 inch.

Accompanying "The auriferous gravels of the Sierra Nevada of California." In Mem. Mus. Comp. Zool. at Cambridge, Mass. Vol. VI. 4°. No. 1. Plate R, p. 444. Cambridge, 1880.

(125)



692.

- 1880—Hendel (C. W.). Map of Poverty Hill, Scales's diggings, and vicinity. Scale,  $1\frac{1}{2}$  inches to the mile.

Accompanying "The auriferous gravels of the Sierra Nevada of California," by J. D. Whitney. In Mem. Mus. Comp. Zool. at Cambridge, Mass. Vol. VI. 4°. No. 1. Plate U, p. 452. Cambridge, 1880.

693.

- 1880—Whitney (J. D.). Sketch map, showing the distribution of the volcanic and gravel formations over a portion of Placer and El Dorado Counties, California.

Accompanying "The auriferous gravels of the Sierra Nevada of California." In Mem. Mus. Comp. Zool. at Cambridge, Mass. Vol. VI. 4°. No. 1. Plate B, p. 82. Cambridge, 1880.

694.

- 1880—Whitney (J. D.). Distribution of the volcanic formations and gravel near Placerville. Scale, 1 mile =  $1\frac{1}{2}$  inches.

Accompanying "The auriferous gravels of the Sierra Nevada of California." In Mem. Mus. Comp. Zool. at Cambridge, Mass. Vol. VI. 4°. No. 1. Plate C, p. 98. Cambridge, 1880.

(126)

**XVI—CENTRAL-WESTERN STATES AND TERRITORIES, COMPRISING NEVADA, UTAH, COLORADO, KANSAS, AND MISSOURI.**

695.

**1855—Meek (F. B.).** Geological map of Moniteau County.

Accompanying "The first and second annual reports of the geological survey of Missouri." Part II, p. 94. Jefferson City, 1855.

696.

**1855—Shumard (B. F.).** Geological map of Franklin County.

Accompanying "The first and second annual reports of the geological survey of Missouri." Part II, p. 168. Jefferson City, 1855.

Black dotted lines and geological indications.

697.

**1855—Shumard (B. F.).** Geological map of Saint Louis County.

Accompanying "The first and second annual reports of the geological survey of Missouri." Part II, p. 184. Jefferson City, 1855.

698.

**1855—Swallow (G. C.).** Geological map of Marion County.

Accompanying "The first and second annual reports of the geological survey of Missouri." Part I, p. 178. Jefferson City, 1855.

699.

**1855—Swallow (G. C.).** Geological map of Cooper County.

Accompanying "The first and second annual reports of the geological survey of Missouri." Part I, p. 202. Jefferson City, 1855.

700.

**1859—Meek (F. B.).** Geological map of Miller County.

Accompanying "Reports of the geological survey of Missouri, 1855-1871," p. 110. Jefferson City, 1873.

701.

**1859—Meek (F. B.).** Geological map of Morgan County.

Accompanying "Reports of the geological survey of Missouri, 1855-1871," p. 134. Jefferson City, 1873.

702.

**1859—Phillips (J. V.).** Geological map, showing the mineral region contiguous to the Iron Mountain Railroad, Missouri. Scale, 2 inches to 6 miles.

Accompanying "Report on the geology of the mineral districts contiguous to the Iron Mountain Railroad." Saint Louis, 1859.

703.

- 1859—Swallow (G. C.).** Geological map of Southwest Branch Pacific Railroad (Missouri).

Accompanying "Geological report of the country along the line of the Southwestern Branch of the Pacific Railroad, State of Missouri." Saint Louis, 1859.

704.

- 1870—Emmons (S. F.).** Geological map of the Toiyabe Mountains (Nevada).

Accompanying "Geological exploration of the fortieth parallel." Vol. III, 4°. Mining Industry. Atlas. Plate 13. New York, 1870.

705.

- 1870—Hague (Arnold).** Geological map of the White Pine mining district (Nevada).

Accompanying "Geological exploration of the fortieth parallel." Vol. III, 4°. Mining Industry. Atlas. Plate 14. New York, 1870.

706.

- 1870—King (Clarence).** Geological map of the Washoe mining district Nevada. Scale, 3 inches to 1 mile.

Accompanying "Geological exploration of the fortieth parallel." Vol. III, 4°. Mining Industry. Atlas. Plate 2. New York, 1870.

707.

- 1872—Pumpelly (Raphael).** Magnetic geological map of the Pilot Knob iron district.

Accompanying "Geological survey of Missouri." Report on the iron ores and coal fields. Atlas. Plate II. New York, 1873.

708.

- 1872—Swallow (G. C.).** Geological map of Missouri.

Accompanying "Geological sketch of the State of Missouri," illustrated by maps. Extract from "Sectional, topographical, and descriptive atlas of the State of Missouri," by R. A. Campbell. Folio. Saint Louis, 1873.

709.

- 1873—Broadhead (G. C.).** Preliminary geological map of Northern Missouri.

Accompanying "Geological survey of Missouri." Report on the iron ores and coal fields. Atlas. Plate V. New York, 1873.

710.

- 1873—Endlich (F. M.).** Geological map of the Central City mining region.

Accompanying "Report of the San Luis division (Colorado); in U. S. Geol. and Geogr. Surv. Territories." Explorations of 1873. Seventh annual report. Part I, p. 280. Washington, 1874.

Black etching.

(128)

711.

- 1873—Endlich (F. M.).** Geological map of the Mount Lincoln mining region.

Accompanying "Report of the San Luis division (Colorado); in U. S. Geol. and Geogr. Surv. Territories." Explorations of 1873. Seventh annual report. Part I, p. 302. Washington, 1874.

Black etching.

712.

- 1873—Marvine (A. R.).** Map of the coal openings, railroad, sections, &c., along the eastern base of the mountains near Denver City. Scale, 6 miles to an inch.

Accompanying "Report of the Middle Park Division (Colorado); in U. S. Geol. and Geogr. Surv. Territories." Explorations of 1873. Seventh annual report. Part I, p. 120. Washington, 1874.

Black etching.

713.

- 1873—Marvine (A. R.).** Geological map of the Middle Park.

Accompanying "Report of the Middle Park Division (Colorado); in U. S. Geol. and Geogr. Surv. Territories." Explorations of 1873. Seventh annual report. Part I, p. 154. Washington, 1874.

Black etching.

714.

- 1873—Marvine (A. R.).** Geological map of the region in the neighborhood of the Hot Springs and the Upper Grand; Middle Park.

Accompanying "Report of the Middle Park Division (Colorado); in U. S. Geol. and Geogr. Surv. Territories." Explorations of 1873. Seventh annual report. Part I, p. 162. Washington, 1874.

Black etching.

715.

- 1873—Potter (W. B.).** Geological map of Lincoln County (Missouri). Scale, 1 mile to 1 inch.

Accompanying "Geological survey of Missouri." Report on the iron ores and coal fields. Atlas. Plate VIII. New York, 1873.

716.

- 1873—Potter (W. B.).** Map of Lincoln County coal region (Missouri.)

Accompanying "Geological survey of Missouri." Report on the iron ores and coal fields. Atlas. Plate IX. New York, 1873.

717.

- 1873—Powell (J. W.).** Green River from the Union Pacific Railroad to the mouth of White River (Utah). Scale, 4 miles to 1 inch.

Accompanying "Report on the geology of the eastern portion of the Uinta Mountains and a region of country adjacent thereto." 4°. Atlas. Washington, 1876.

(129)

718.

**1873—Shumard (B. F.). Geological map of Ozark County.**

Accompanying "Geological survey of Missouri, 1855-1871," p. 188. Jefferson City, 1873.

719.

**1873—Shumard (B. F.). Geological map of Wright County.**

Accompanying "Geological survey of Missouri, 1855-1871," p. 205. Jefferson City, 1873.

Black, with geological indications.

720.

**1873—Shumard (B. F.). Geological map of Pulaski County.**

Accompanying "Geological survey of Missouri, 1855-1871," p. 224. Jefferson City, 1873.

Black, with geological indications.

721.

**1873—Shumard (B. F.). Geological map of Cape Girardeau County.**

Accompanying "Geological survey of Missouri, 1855-1871," p. 274. Jefferson City, 1873.

Black, with geological indications.

722.

**1873—Shumard (B. F.). Geological map of Saint Geneviève County.**

Accompanying "Geological survey of Missouri, 1855-1871," p. 290. Jefferson City, 1873.

Black, with dotted lines and geological indications.

723.

**1873—Shumard (B. F.). Geological map of Jefferson County.**

Accompanying "Geological survey of Missouri, 1855-1871," p. 304. Jefferson City, 1873.

724.

**1873—Shumard (B. F.). Geological map of Clark County.**

Accompanying "Geological survey of Missouri, 1855-1871," p. 314. Jefferson City, 1873.

725.

**1874—Broadhead (G. C.) and Schmidt (A.). Missouri geological survey. Map of the lead region of Central Missouri.**

Accompanying "Geological survey of Missouri, 1873-1874." Atlas, folio. Jefferson City, 1874.

Black, with geological indications.

726.

**1874—Broadhead and Norwood, assisted by Schmidt (A.) and Leonhard (A.). Geological map of Jasper County, with lead region of Jasper and Newton Counties.**

Accompanying "Geological survey of Missouri, 1873-1874." Atlas, folio. Jefferson City, 1874.

727.

- 1874.—Broadhead (G. C.). Missouri geological survey. Cedar County.  
Accompanying "Geological survey of Missouri, 1873-1874." Atlas, folio.  
Jefferson City, 1874.

728.

- 1874.—Broadhead (G. C.). Missouri geological survey. Barton County.  
Accompanying "Geological survey of Missouri, 1873-1874." Atlas, folio.  
Jefferson City, 1874.

729.

- 1874.—Broadhead (G. C.). Missouri geological survey. Vernon County.  
Accompanying "Geological survey of Missouri, 1873-1874." Atlas, folio.  
Jefferson City, 1874.

730.

- 1874.—Broadhead (G. C.) and Norwood (C. J.). Missouri geological survey.  
Howard County.  
Accompanying "Geological survey of Missouri, 1873-1874." Atlas, folio.  
Jefferson City, 1874.

731.

- 1874.—Broadhead (G. C.) and Norwood (C. J.). Missouri geological survey.  
Part of Northern Missouri.  
Accompanying "Geological survey of Missouri, 1873-1874." Atlas, folio.  
Jefferson City, 1874.  
Black, with dotted lines and geological indications.

732.

- 1874.—Broadhead (G. C.) and Norwood (C. J.). Missouri geological survey.  
Madison County.  
Accompanying "Geological survey of Missouri, 1873-1874." Atlas, folio.  
Jefferson City, 1874.

733.

- 1874.—Hayden (F. V.) and Holmes (W. H.). Geological map of Colorado  
Springs and vicinity, Colorado. Scale, 1 mile to 1 inch.  
Accompanying U. S. Geol. and Geogr. Surv. Territories. Explorations of 1874.  
"Report of F. V. Hayden." Eighth annual report, p. 40. Washington, 1876.  
Pink etching.

734.

- 1874.—Hayden (F. V.). Preliminary map of the eastern base of the  
Rocky Mountains, Colorado, from the Arkansas River to the  
Wyoming line, showing the limits of the sedimentary rocks, and  
also the coal outcrops. Scale, 4 miles to 1 inch.  
Accompanying U. S. Geol. and Geogr. Surv. Territories. Explorations of 1874.  
"Report of F. V. Hayden." Eighth annual report, p. 41. Washington, 1876.  
Black, with geological indications.

(131)

735.

- 1874—Hayden (F. V.) and Holmes (W. H.).** Map of the Elk Mountains, Colorado. Scale, 2 miles to 1 inch.

Accompanying "Report on the geology of the northwestern portion of the Elk range." In U. S. Geol. and Geogr. Surv. Territories. Explorations of 1874. Eighth annual report, p. 72. Washington, 1876.

Blue etching.

736.

- 1874—Peale (A. C.).** Map A. Shewing lines of sections (on Eagle River).

Accompanying "Report of middle division (Colorado)." In U. S. Geol. and Geogr. Surv. Territories. Explorations of 1874. Eighth annual report, p. 84. Washington, 1876.

Black etching.

737.

- 1874—Peale (A. C.).** Map B. Showing lines of section (across Gunnison River).

Accompanying "Report of middle division (Colorado)." In U. S. Geol. and Geogr. Surv. Territories. Explorations of 1874. Eighth annual report, p. 100. Washington, 1876.

Black etching.

738.

- 1874—Peale (A. C.).** Map C. Showing areas of porphyritic trachyte (Elk Mountains).

Accompanying "Report of middle division (Colorado)." In U. S. Geol. and Geogr. Surv. Territories. Explorations of 1874. Eighth annual report, p. 166. Washington, 1876.

739.

- 1874—Peale (A. C.).** Map D. Showing areas of rhyolite and breccia (across the Gunnison River).

Accompanying "Report of middle division (Colorado)." In U. S. Geol. and Geogr. Surv. Territories. Explorations of 1874. Eighth annual report, p. 170. Washington, 1876.

Black etching.

740.

- 1874—Peale (A. C.).** Map E. Showing basaltic plateaus between the Grand and Gunnison Rivers.

Accompanying "Report of middle division (Colorado)." In U. S. Geol. and Geogr. Surv. Territories. Explorations of 1874. Eighth annual report, p. 174. Washington, 1876.

Black etching.

741.

- 1875—Endlich (F. M.).** (Geological) Map of Baker's Park and vicinity, (Colorado).

Accompanying "Report on the mines and geology of the San Juan Country." In Bulletin of the U. S. Geol. and Geogr. Surv. Territories. Vol. I, No. 3, second series, p. 164. Washington, 1875.

Black etching.

(132)

742.

**1875—Endlich (F. M.). Map of Spanish Peaks region.**

Accompanying "Geological report on the southeastern district (Colorado)." In U. S. Geol. and Geogr. Surv. Territories. Explorations of 1875. Ninth annual report, p. 132. Washington, 1877.  
Black etching.

743.

**1875—Endlich (F. M.). Map of Trinidad region.**

Accompanying "Geological report on the southeastern district (Colorado)." In U. S. Geol. and Geogr. Surv. Territories. Explorations of 1875. Ninth annual report, p. 196. Washington, 1877.  
Black etching.

744.

**1875—Peale (A. C.). Map of south side of Gunnison River.**

Accompanying "Geological report on the Grand River district (Colorado)." In U. S. Geol. and Geogr. Surv. Territories. Explorations of 1875. Ninth annual report, p. 38. Washington, 1877.  
Black etching.

745.

**1875—Peale (A. C.). Map of Unaweep Cañon, Colorado.**

Accompanying "Geological report on the Grand River district (Colorado)." In U. S. Geol. and Geogr. Surv. Territories. Explorations of 1875. Ninth annual report," p. 58. Washington, 1877.  
Black etching.

746.

**1876—Gilbert (G. K.), Marvine (A. R.), and Howell (E. E.). Parts of Eastern California, Southeastern Nevada, Northwestern Arizona, and Southwestern Utah. Scale, 1 inch to 8 miles, or 1:506,880.**

Accompanying "Geological atlas projected to illustrate United States geographical surveys west of the 100th meridian of longitude, under the command of First Lieut. Geo. M. Wheeler." New York, 1876.

747.

**1876—Gilbert (G. K.), Marvine (A. R.), and Howell (E. E.). Southern and Southwestern Utah. Scale, 1 inch to 8 miles, or 1:506,880.**

Accompanying "Geological atlas projected to illustrate United States geographical surveys west of the 100th meridian of longitude, under the command of First Lieut. Geo. M. Wheeler." New York, 1876.

748.

**1876—Gilbert (G. K.) and Howell (E. E.). Restored outline of Lake Bonneville. Scale, 1 inch to 17 miles.**

Accompanying "Geological atlas projected to illustrate United States geographical surveys west of the 100th meridian of longitude, under the command of First Lieut. Geo. M. Wheeler." New York, 1876.

Not exactly a geological map, but a restoration of a great fresh-water lake (Lake Bonneville) as it existed during the quaternary period. Great Salt Lake, Utah Lake, and Sevier Lake are remains of that great lake, equal in extent to Lake Huron.



749.

- 1876—Gilbert (G. K.), Marvine (A. R.), and Howell (E. E.). Central and Western Utah. Scale, 1 inch to 8 miles, or 1 : 506,880.

Accompanying "Geological atlas projected to illustrate United States geographical surveys west of the 100th meridian of longitude, under the command of First Lieut. Geo. M. Wheeler." New York, 1876.

750.

- 1876—King (Clarence). Geological series. Map III. Utah basin. Scale, 4 miles to 1 inch.

Accompanying "Geological exploration of the fortieth parallel." Geological and topographical atlas, folio. (New York) 1876.

Two sheets.

751.

- 1876—King (Clarence). Geological series. Map IV. Nevada plateau. Scale, 4 miles to 1 inch.

Accompanying "Geological exploration of the fortieth parallel." Geological and topographical atlas, folio. (New York) 1876.

Two sheets.

752.

- 1876—King (Clarence). Geological series. Map V. Nevada basin. Scale, 4 miles to 1 inch.

Accompanying "Geological exploration of the fortieth parallel." Geological and topographical atlas, folio. (New York) 1876.

Two sheets.

The geological maps of the great folio atlas accompanying Clarence King's "Exploration of the fortieth parallel," five in numbers in ten sheets—in fact 10 geological maps—extending from Cheyenne to Pyramid Lake, are a valuable contribution to the geology of a part of the Rocky Mountains and Great Basin in the vicinity of the fortieth parallel. Mr. King had two other geologists associated with him, Messrs. S. F. Emmons and Arnold Hague. It is to be regretted that the Spanish word *Cordilleras* has been used most indiscriminately and inappropriately. Spanish geographers will be surprised to learn that mountain ranges which have been placed by them as Sierras since their discovery, are Cordilleras. It is not only a misapplication of the word Cordillera, but an injustice toward the first scientific explorer of this region, General John C. Fremont, who gave the very appropriate name of "Great Basin" to the whole region between the Sierra Nevada and the Wasatch Mountains.

753.

- 1876—Peale (A. C.). Map of area B, showing the geology of Grand River Valley and the Book Cliffs.

Accompanying "Geological report on the Grand River district (Colorado)." In U. S. Geol. and Geogr. Surv. Territories. Explorations of 1876. Tenth annual report. Plate XI, p. 176. Washington, 1878.

Black etching.

(134)

754.

- 1876—Peale (A. C.).** Geological map of area A (lying between the San Miguel and Dolores Rivers).

Accompanying "Geological report on the Grand River district (Colorado)." In U. S. Geol. and Geogr. Surv. Territories. Explorations of 1876. Tenth annual report. Plate VIII, p. 165. Washington, 1878.  
Black etching.

755.

- 1876—White (C. A.).** Geological map of a part of Northwest Colorado.

Accompanying "Report on the geology of a portion of Northwestern Colorado." In U. S. Geol. and Geogr. Surv. Territories. Explorations of 1876. Tenth annual report. Plate II, p. 60. Washington, 1878.  
Black etching.

756.

- 1877.—Gilbert (G. K.).** Map of the Henry Mountains. (Colored geologically) from a model in relief.

Accompanying "Report on the geology of the Henry Mountains." 4°. Southern Utah. Plate V. Washington, 1877.

757.

- 1877—Hayden (F. V.).** Northwestern Colorado and part of Utah. Scale, 4 miles to 1 inch, or 1:253,440.

Accompanying "Geological and geographical atlas of Colorado and portions of adjacent territory." Folio. Sheet XI. New York, 1877.

Published 1878. A. R. Marvine, A. C. Peale, F. M. Endlich, and C. A. White, geological assistants. Surveyed 1874-'76.

758.

- 1877—Hayden (F. V.).** Northern Central Colorado. Scale, 4 miles to 1 inch, or 1:253,440.

Accompanying "Geological and geographical atlas of Colorado and portions of adjacent territory." Folio. Sheet XII. New York, 1877.

Published 1878. A. R. Marvine, A. C. Peale, and W. H. Holmes, geological assistants. Surveyed in 1873-'74, and '75.

759.

- 1877—Hayden (F. V.).** Central Colorado. Scale, 4 miles to 1 inch, or 1:253,440.

Accompanying "Geological and geographical atlas of Colorado and portions of adjacent territory." Folio. Sheet XIII. New York, 1877.

Published 1878. F. M. Endlich, A. C. Peale, and W. H. Holmes, geological assistants. Surveyed in 1873-'74, and '75.

760.

- 1877—Hayden (F. V.).** Western Colorado and part of Utah. Scale, 4 miles to 1 inch, or 1:253,440.

Accompanying "Geological and geographical atlas of Colorado and portions of adjacent territory." Folio. Sheet XIV. New York, 1877.

Published 1878. A. C. Peale and W. H. Holmes, geological assistants. Surveyed in 1874-'75, and '76.

(135)

761.

**1877—Hayden (F. V.).** Southwestern Colorado and parts of New Mexico, Arizona, and Utah. Scale, 4 miles to 1 inch, or 1:253,440.

Accompanying "Geological and geographical atlas of Colorado and portions of adjacent territory." Folio. Sheet XV. New York, 1877.

Published 1878. W. H. Holmes and F. M. Endlich, geological assistants. Surveyed in 1874-'75.

762.

**1877—Hayden (F. V.).** General geological map of Colorado. Scale, 12 miles to 1 inch.

Accompanying "Geological and geographical atlas of Colorado and portions of adjacent territory." Folio. Sheet IV. New York, 1877.

Published in 1878. This map has been republished from the atlas for report for 1876, and also for separate distribution.

763.

**1877—Hayden (F. V.).** Southern Central Colorado and part of New Mexico. Scale, 4 miles to 1 inch, or 1:253,440.

Accompanying "Geological and geographical atlas of Colorado and portions of adjacent territory." folio. Sheet XVI. New York, 1877.

Published 1878. F. M. Endlich, geological assistant. Surveyed in 1874-'75.

764.

**1878—King (Clarence).** Analytical geological map of the area of exploration of the fortieth parallel. I. Archæan and granitic exposures. Scale, 30 statute miles to 1 inch.

Accompanying "Geological exploration of the fortieth parallel." 4°. Vol. I. Systematic geology, p. 126. Washington, 1878.

765.

**1878—King (Clarence).** Analytical geological map of the area of the exploration of the fortieth parallel. II. Archæan, granitic, and paleozoic exposures. Scale, 30 statute miles to 1 inch.

Accompanying "Geological exploration of the fortieth parallel." 4°. Vol. I. Systematic geology, p. 248. Washington, 1878.

766.

**1878—King (Clarence).** Analytical geological map of the area of the exploration of the fortieth parallel. III. Pre-mesozoic and mesozoic exposure. Scale, 30 statute miles to 1 inch.

Accompanying "Geological exploration of the fortieth parallel." 4°. Vol. I. Systematic geology, p. 356. Washington, 1878.

767.

**1878—King (Clarence).** Analytical geological map of the area of the exploration of the fortieth parallel. IV. Tertiary exposures. Scale, 30 statute miles to 1 inch.

Accompanying "Geological exploration of the fortieth parallel." 4°. Vol. I. Systematic geology, p. 458. Washington, 1878.

(136)

768.

- 1878—**King** (Clarence). Analytical geological map. VIII, IX, XI, and XII. Exposures of successive orographic disturbances.

Accompanying "Geological exploration of the fortieth parallel." 4°. Vol. I. Systematic geology, p. 760. Washington, 1879.

A set of five maps corresponding to atlas maps I, II, III, IV, V; giving geological axes, strike, dip, and angle of the strata.

769.

- 1878—**King** (Clarence). Analytical geological map of the area of the exploration of the fortieth parallel. V. Glaciers of the ice age. Scale, 30 statute miles to an inch.

Accompanying "Geological exploration of the fortieth parallel." 4°. Vol. I. Systematic geology, p. 486. Washington, 1878.

This map is not geological, but merely a physical map giving a more or less exact topographical and physical map of the country during quaternary time.

770.

- 1878—**King** (Clarence). Analytical geological map of the area of the exploration of the fortieth parallel. VI. Lakes of the glacial period.

Accompanying "Geological exploration of the fortieth parallel." 4°. Vol. I. Systematic geology, p. 529. Washington, 1878.

A physical map, only.

771.

- 1878—**King** (Clarence). Analytical geological map of the area of the exploration of the fortieth parallel. VII. Tertiary volcanic rocks. Scale, 30 statute miles to 1 inch.

Accompanying "Geological exploration of the fortieth parallel." 4°. Vol. I. Systematic geology, p. 677. Washington, 1878.

772.

- 1878—**Mudge** (B. F.). Map showing the superficial strata of Kansas.

Accompanying "Geology of Kansas." Topeka, 1878.

773.

- 1879—**Dutton** (C. E.). Geological map of the district of the high plateaus of Utah. Scale, 1 inch to 4 miles.

Accompanying "Report on the geology of the high plateaus of Utah, with atlas." 4°. Atlas, folio, sheet II. New York, 1879.

The atlas is dated 1879, the report 1880, and the distribution of both took place in 1881.

774.

- 1881—**Becker** (G. F.). Geological map of Virginia, Nevada, and immediate vicinity. Scale, 1 inch = 1,500 feet.

Accompanying "A summary of the geology of the Comstock lode and the Washoe district." Second annual report of the United States geological survey. Report of the Secretary of the Interior for 1881. Vol. III, Plate, XLVI, p. 293. Washington, 1881.

(137)

## 775.

- 1881—**Dutton** (C. E.). Sketch map showing the distribution of the strata and eruptive rocks in the western part of the plateau province. Scale, 16 miles to 1 inch, or 1 : 1,000,000 nearly.

Accompanying "The physical geology of the Grand Cañon district." Second annual report of the United States geological survey. Report of the Secretary of the Interior for 1881. Vol. III. In pocket in back of volume. Washington, 1881.

## 776.

- 1881—**Emmons** (S. F.). Geological map of Leadville and vicinity, Lake County, Colorado. Scale  $\frac{1}{2}$  mile to 1 inch, or 1:2,640.

Accompanying "Abstract of report on geology and mining industry of Leadville, Lake county, Colorado." Second annual report of the United States geological survey. Report of the Secretary of the Interior for 1881, Vol. III, Plate XLIV, p. 240. Washington, 1881.

Carefully made geological map of a difficult and complicated district. Printed also separately.

## 777.

- 1881—**Hague** (Arnold). Geological map of Ruby Hill, Eureka mining district, Nevada.

Accompanying "Report of Mr. Arnold Hague. Division of the Pacific." Second annual report of the United States geological survey. Report of the Secretary of the Interior for 1881. Vol. III, Pl. IX, p. 22. Washington, 1881.

## 778.

- 1881—**Scudder** (S. H.). The tertiary lake basin at Florissant, Colorado. Scale, 1 mile to 1 inch.

Accompanying "The tertiary lake basin, at Florissant, Colorado, between South and Hayden Parks." In Bulletin of the U. S. Geol. and Geogr. Surv. Territories. Vol. VI, No. 2, p. 300. Washington, 1881.

Black etching.

**XVII.—SOUTHWESTERN STATES AND TERRITORIES, COMPRISING ARKANSAS, LOUISIANA, INDIAN TERRITORY, NEW MEXICO, TEXAS, AND ARIZONA.**

779.

**1849—Roemer (Ferdinand).** Topographisch-geognostische karte von Texas.

Accompanying "Texas." Bonn, 1849.

A very important geological map, the first of Texas.

780.

**1856—Antisell (Thomas).** Geological plan and section from the Rio Grande to the Pimas villages, explored in 1856 by Lieut. John G. Parke. Scale, 1 : 1,200,000, nearly.

Accompanying "Reports of explorations and surveys for a Railroad route from the Mississippi River to the Pacific Ocean." 4to. Vol. VII, p. 206. Washington, 1857.

781.

**1856—Blake (W. P.).** Geological map of the route explored by Lieut. A. W. Whipple, near the parallel of the 35° north latitude, from the Mississippi River to the Pacific Ocean. Prepared from the notes and collections of the geologist of the expedition, Mr. Jules Marcou.

Accompanying "Report of explorations and surveys for a Railroad route from the Mississippi River to the Pacific Ocean." 4to. Vol. III, p. 176, of Geological Report. Washington, 1856.

782.

**1857—Blake (W. P.).** Geological map of the route explored by Capt. John Pope, near the 32d parallel of north latitude, from the Red River to the Rio Grande. Scale of 1 : 3,000,000.

Accompanying "Reports of explorations and surveys for a Railroad route from the Mississippi River to the Pacific Ocean." 4to. Vol. II, p. 40, of Geological Report. Washington, 1855.

The date of the publication of this volume is very confused. At the title page the date is 1855; on the geological map it is marked 1854; the report on the geology is dated 1856; and, finally, an explanatory note to geological report by John Pope is dated 1857. This last date is the true one.

783.

- 1857—Maroon (Jules).** Geological map of New Mexico, from a survey made during the months of September, October, November and December, 1853. Scale, 1 : 900,000.

Accompanying "Geology of North America; with two reports on the prairies of Arkansas and Texas, the Rocky Mountains of New Mexico, and the Sierra Nevada of California." Originally made for the United States Government. 4to. Plate VIII. Zurich, 1858.

This map is the first geological map of New Mexico, and the first detailed geological map of any part of the country west of the 100th meridian.

784.

- 1858—Newberry (J. S.).** Geological maps No. 1 and No. 2. Rio Colorado of the West (Arizona). Scale, 12 miles to an inch, or 1 : 760,320.

Accompanying "Geological report of the Colorado exploring expedition," Lieut. J. C. Ives in command. 4to. Washington, 1861.

Two sheets.

785.

- 1870—Hopkins (F. V.).** Preliminary geological map of Louisiana.

Accompanying "First annual Report of the Louisiana geological survey, 1869. Louisiana State University, Baton Rouge." New Orleans, 1870.

The same map, without changes or alterations, accompanies the Second annual Report of the Louisiana geol. surv., New Orleans, 1871.

786.

- 1871—Hopkins (F. V.).** Preliminary geological map of Louisiana.

Accompanying Second annual Report of the Louisiana geological survey. New Orleans, 1871.

See Hopkins (F. V.). 1870—No. 785.

787.

- 1871—Hilgard (E. W.).** Geological map of the Mississippi embayment.

Accompanying "On the geological history of the Gulf of Mexico." Amer. Journ. Silliman. 3d series, Vol. II. New Haven, 1871.

Black etching.

788.

- 1871—Hilgard (E. W.).** Geological map of the Mississippi embayment.

Accompanying "On the geology of lower Louisiana, and the salt deposits on Petite Anse Island." In Smithsonian Contributions to knowledge. 4<sup>o</sup>. p. 28. Washington, 1872.

Black etching.

789.

- 1872—Loew (Oscar) and Roessler (A. R.).** Erforschung von Nordwest—Texas. Scale, 1 : 2,500,000.

Accompanying "Erforschung des Nordwest-theiles von Texas im Jahre, 1872." Nach den Aufzeichnungen von Dr. O. Loew und A. Roessler zusammengestellt von Abb. S. Gatschet, in New York. Petermann's geographische Mittheilungen 4<sup>o</sup>. Vol. XIX, Plate XXIII. 1873. Gotha, 1873.

(140)

790.

- 1874—Roessler (A. R.).** A. S. Roessler's latest map of the State of Texas exhibiting mineral and agricultural districts, &c. Scale, 20 miles to an inch. New York, 1874.

791.

- 1875—Gilbert (G. K.).** Geological map of the Nutria fold and Zuñi range. Scale, 8 miles to 1 inch.

Accompanying "Geology of portions of New Mexico and Arizona;" in Report upon geographical and geological surveys west of the 100th meridian, in charge of first Lieut. Geo. M. Wheeler. Vol. III, geology. 4°. p. 561. Washington, 1875.

Black etching.

792.

- 1875—Roessler (A. R.).** Map of Llano County (Texas) showing geology, mineral localities, topography, &c. Scale, 4,000 varas to an inch. New York, 1875.

793.

- 1876—Gilbert (G. K.), Marvine (A. R.), and Howell (E. E.).** Parts of Northern and Northwestern Arizona and Southern Utah. Scale, 1 inch to 8 miles, or 1:506,880.

Accompanying "Geological atlas projected to illustrate geographical explorations and surveys west of the 100th meridian of longitude, under the command of First Lieut. Geo. M. Wheeler." Sheet number 67. New York, 1876.

794.

- 1877—Marcou (Jules), Gilbert (G. K.), and Marvine (A. R.).** Parts of Central and Western Arizona. Scale, 1 inch to 8 miles, or 1:506,880.

Accompanying "Geological atlas projected to illustrate geographical explorations and surveys west of the 100th meridian of longitude, under the command of First Lieut. Geo. M. Wheeler." Sheet number 75. New York, 1877.

795.

- 1877—Gilbert (G. K.), Marvine (A. R.), and Howell (E. E.).** Part of Eastern Arizona and Western New Mexico. Scale, 1 inch to 8 miles, 1:506,880.

Accompanying "Geological atlas projected to illustrate geographical explorations and surveys west of the 100th meridian of longitude, under the command of First Lieut. Geo. M. Wheeler." Sheet number 76. New York, 1877.

Although my notes of 1853-1854 of the exploration of Lieut. A. W. Whipple have been made use of to a certain extent for the geographical distribution of the basalt, triassic, and carboniferous rocks, I requested Lieutenant Wheeler to withdraw my name from the list of geological assistants, on the ground of difference of opinion in regard to the geological age of several groups of rocks.—J. MARCOU.

(141)



796.

- 1877—Gilbert (G. K.), Howell (E. E.), and Loew (Oscar). Parts of Eastern and Southeastern Arizona, Western and Southwestern New Mexico. Scale, 1 inch to 8 miles, or 1:506,880.

Accompanying "Geological atlas projected to illustrate geographical explorations and surveys west of the 100th meridian of longitude, under the command of First Lieut. Geo. M. Wheeler." Sheet number 83. New York, 1877.

The Wheeler Geological Atlas, containing eleven sheets, published between 1875 and 1881, inclusive, is a very important contribution to our knowledge of the geology of the western regions.

797.

- 1877—Stevenson (J. J.). Part of North Central New Mexico. Scale, 1 inch to 4 miles, or 1:253,440.

Accompanying "Geological atlas projected to illustrate geographical explorations and surveys west of the 100th meridian of longitude, under the command of First Lieut. Geo. M. Wheeler." (New York.) (1877.)

See the same map by Stevenson (J. J.), 1881—No. 800.

798.

- 1881—Gilbert (G. K.), Marvine (A. R.), and Howell (E. E.). Parts of Colorado and New Mexico. Scale, 1 inch to 4 miles, or 1:253,440.

Accompanying "Geological atlas projected to illustrate geographical explorations and surveys west of the 100th meridian of longitude, under the command of First Lieut. Geo. M. Wheeler." New York, 1876.

Parts of sheets number 69, 77, and 78 of the geographical atlas, but in one sheet only of geological atlas.

799.

- 1881—Stevenson (J. J.). Parts of Southern Colorado and Northern New Mexico. Scale 1 inch to 4 miles, or 1:253,440.

Accompanying "Geological atlas projected to illustrate geographical explorations and surveys west of the 100th meridian of longitude, under the command of First Lieut. Geo. M. Wheeler." Sheet number 70 A. New York, 1881.

A first and very limited issue of this sheet was issued in May, 1877.

800.

- 1881—Stevenson (J. J.). Part of North Central New Mexico. Scale, 1 inch to 4 miles, or 1:253,440.

Accompanying "Geological atlas projected to illustrate geographical explorations and surveys west of the 100th meridian of longitude, under the command of First Lieut. Geo. M. Wheeler." Sheet number 70 C. New York, 1881.

It is a second edition; the first being issued in May, 1877, but not distributed.

(142)

801.

**1881—Stevenson (J. J.).** Part of Colorado and New Mexico. Scale, 1 inch to 4 miles, or 1:253,440.

Accompanying "Geological atlas projected to illustrate geographical explorations and surveys west of the 100th meridian longitude, under the command of First Lieut. Geo. M. Wheeler." New York, 1881.

Parts of sheets numbers 69 B, 69 D, 77 B, and 78 A, in one single sheet.

Prof. Cope and Dr. Oscar Loe assisted in part for the fragment of map No. 69 D.

N. B.—The three last maps by Stevenson (J. J.), Nos. 779, 800, and 801, were placed in pocket in back of Vol. III.—Supplement—Geology.—In Report upon United States geographical surveys west of the 100th meridian, in charge of Captain Geo. M. Wheeler. 4°. Washington, 1881.

(143)

**XVIII.—MEXICO.**

802.

- 1832—Burkhart (Joseph).** Geognostische Skizze des Weges von Talpujahua nach Huetamo dem Jorullo und Valladolid. Maasstab von 20 leguas 26.63 auf einen Grad.

Accompanying "Geognostische Bemerkungen, gesammelt auf einer Reise von Talpujahua nach Huetamo, dem Jorullo, Patzcuaro, und Valladolid, im Staate von Michoacan." Karsten Archiv für Mineralogie, &c. Vol. V, Plate III. Berlin, 1832.

803.

- 1836—Burkhart (Joseph).** Karte des Gebirges von Zacatecas.

Accompanying "Aufenthalt und Reisen in Mexico in den Jahren 1825 bis 1834." Stuttgart, 1836.

Not seen.

804.

- 1838—Galeotti (H. G.)** Carte géognostique des environs de Zimapan au Mexique.

Accompanying "Notice géologique sur les environs de San José del Oro." Bulletin de l'Académie royale de Belgique, Vol. V, p. 737. Bruxelles, 1838.

805.

- 1864—Egloffstein (Baron F. W.) and Gerolt (Baron Frederick von).** Geological map and profiles of some of the principal mining districts of Mexico. Scale of 12 miles to the inch, or 1 : 760,320.

Accompanying "Contributions to the geology and the physical geography of Mexico." New York, 1864.

**Egloffstein** is only the editor. The true author of the geological map, profiles, and descriptions is Baron Frederick von **Gerolt**, formerly Prussian minister at Mexico and afterwards at Washington.

806.

- 1865—Dollfus (Auguste) and Montserrat (Eugène de).** Croquis géologique et topographique des environs de Toluca. Scale, 1 : 300,000.

Accompanying "Archives de la commission scientifique du Mexique." Tome III, p. 28. Paris, 1867.

807.

- 1867—Dollfus (Auguste), Montserrat (Eugène de), et Pavie (Paul).** Carte géologique du district minier de Zomelahuacan. Scale, 1 : 75,000.

Accompanying "Archives de la commission scientifique du Mexique." Tome II, p. 338. Paris, 1867.

808.

- 1871—Barroso (Agustin).** Carta geologica del istmo de Tehuantepec, formada por la comision Mexicana que exploro el Istmo el ano, 1871. Scale, 1 : 500,000.

Accompanying "Memoria sobre la geologia del istmo de Tehuantepec." Anales del ministerio de Fomento de la republica Mexicana." Tomo III, p. 330. Mexico, 1880.

Date of exploration, 1871. Date of report, April, 1874, and date of publication, 1880.

809.

- 1871—Castillo (Antonio del).** Mapa topografico y geognostico de las inmediaciones de las minas de azogue del Tequezquite en el departamento de Zacatecas. Scale, 3,000 varas mexicanas.

Accompanying "Memoria sobre las Minas de azogue de America." La Naturaleza, p. 48. 4°. Mexico, 1871.

Black, with mineralogical indications.

810.

- 1871—Spear (J. C.).** Geological map of the isthmus of Tehuantepec.

Accompanying "Reports of exploration and surveys, to ascertain the practicability of a ship canal between the Atlantic and Pacific Oceans," by Robert W. Shufeldt, Captain, U. S. N. 4°. Washington, 1872.

More exactly, a mineralogical and lithological map.

811.

- 1873—Barcena (Mariano).** Croquis geologico de una parte del estado de Queretaro.

Accompanying "Memoria presentada al Senor don Blas Balcarcel, director de la escuela especial de Ingenieros." Ministerio de justicia e instruccion publica de los Estados-Unidos Mexicanos. P. 9. 4°. Mexico, 1873.

812.

- 1875—Iglesias (Miguel), Barcena (Mariano), et Matute (J. I.).** Plano geologico del volcan del Ceboruco. Scale, 1 : 75,000.

Accompanying "Memoria de la comision exploradora del volcan del Ceboruco," near Tepic Jalisco. Anales del ministerio de Fomento de la republica Mexicana. Tomo I, p. 115, febrero de 1877. Mexico, 1877.

813.

- 1876—Barcena (Mariano).** Carta geologica de una parte del estado de Aguas Calientes.

Accompanying "Noticia geologica del Estado de Aguas calientes." El Propagador industrial. Tomo I, p. 348. 4°. Mexico, 1876.

814.

- 1877—Barcena (Mariano).** Formacion geologica del camino de Pachuca a Jacala y del distrito de este nombre, en el estado de Hidalgo.

Accompanying "Noticia cientifica de una parte del estado de Hidalgo." Anales del Ministerio de Fomento de la republica Mexicana. Tomo I. Marzo de 1877, p. 340. Mexico, 1877.

(145)

**XIX.—WEST INDIES OR ANTILLES, COMPRISING ALL THE ISLANDS  
BETWEEN THE BAHAMAS AND TRINIDAD.**

815.

- 1819—Nugent (Nicholas).** Map of the island of Antigua, in the West Indies.

Accompanying "A sketch of the geology of the island of Antigua." Transactions of the Geological Society. 4°. Vol. V, Plate XXXII. London, 1821.

816.

- 1821—Maycock (J. D.).** Geological map of Barbadoes.

Accompanying "Geological description of Barbadoes, with a map of the island." The quarterly journal of science of the Royal Institution of Great Britain. Volume XI, Pl. I. London, 1821.

817.

- 1825—De la Beche (H. T.).** Geological map of part of Jamaica.

Accompanying "Remarks on the geology of Jamaica." Transactions of the Geological Society, 2d series, 4°. Vol. II, Part II, Plate XVIII. London, 1827.

818.

- 1843—Taylor (R. C.).** Rough sketch or reconnaissance of the copper region and of the geology of the Savanna region of Gibara in the island of Cuba. Scale, 1 mile to 1 inch.

Accompanying "Memoir on the character and prospects of the copper region of Gibara, and a sketch of the geology of the northeast part of the island of Cuba." Trans. Amer. Phil. Soc. New Series, 4°, Vol. IX, Article VII, Plate XXXIII. Philadelphia, 1846.

Black with geological indications.

819.

- 1860—Wall (G. P.) and Sawkins (J. G.).** Geological map of Trinidad. Scale, 1 inch to 4 miles.

Accompanying "Report on the geology of Trinidad." London, 1860.

820.

- 1864—Duncan (P. M.) and Wall (G. P.).** Geological sketch-map of the district of upper Clarendon, Jamaica.

Accompanying "A notice of the geology of Jamaica, especially with reference to the district of Clarendon." Journ. Geol. Soc. London, Vol. XXI, p. 3, London, 1865.

Black etching.

821.

- 1865—Sawkins (J. G.) and Brown (O. Barrington).** Geological map of Jamaica. Scale, one mile to  $\frac{1}{4}$  of an inch, or 1:253,410.

Accompanying "Reports on the geology of Jamaica." London, 1869.

822.

- 1866—Julien (A. A.).** Key of Sombrero, W. I. Scale, 800 feet to the inch.

Accompanying "On the geology of the Key of Sombrero, West India." *Annals of Lyceum of Natural History of New York*, Vol. VIII, Plate IV. New York, 1867.

Black etching.

823.

- 1871—Cleve (P. T.).** Map of Salt Island, Cooper Island, Ginger Island, and Round Rock.

Accompanying "On the geology of the northeastern West India Islands." *Kongl. Svenska Vetenskaps-Akademiens Handlingar*, Bandet 9, No. 12, p. 13. 4°. Stockholm, 1871.

Black etching.

824.

- 1871—Cleve (P. T.).** No title (map of Puerto Rico).

Accompanying "On the geology of the northeastern West India Islands." *Kongl. Svenska Vetenskaps-Akademiens Handlingar* Bandet 9, No. 12, p. 15. 4°. Stockholm, 1871.

Black etching.

825.

- 1871—Cleve (P. T.).** No title (map of Saba Island).

Accompanying "On the geology of the northeastern West India Islands." *Kongl. Svenska Vetenskaps-Akademiens Handlingar*, Bandet 9, No. 12, p. 19. 4°. Stockholm, 1871.

Black etching.

826.

- 1871—Cleve (P. T.).** Map of St. Martin.

Accompanying "On the geology of the northeastern West India Islands." *Kongl. Svenska Vetenskaps-Akademiens Handlingar*, Bandet 9, No. 12, p. 23. 4°. Stockholm, 1871.

Black etching.

827.

- 1871—Cleve (P. T.).** Geological map over the northeastern West India Islands. Scale, 1:751,000.

Accompanying "On the geology of the northeastern West India Islands." *Kongl. Svenska Vetenskaps-Akademiens Handlingar*, Bandet 9, No. 12, Taf. I. 4°. Stockholm, 1871.

Black etching.

(147)

828.

- 1871—Cleve (P. T.). Geological map over a part of the Virgin Islands, W. I.

Accompanying "On the geology of the northeastern West India Islands." Kongl. Svenska Vetenskaps-Akademiens Handlingar, Bandet 9, No. 12, Tafl. II. 4°. Stockholm, 1871.

Black etching.

829.

- 1871—Cleve (P. T.). Geological map over St. Croix.

Scale,  $\frac{1}{250,000}$ .

Accompanying "On the geology of the northeastern West India Islands." Kongl. Svenska Vetenskaps-Akademiens Handlingar, Bandet 9, No. 12, Tafl. II. 4°. Stockholm, 1871.

Black etching.

830.

- 1871—Cleve (P. T.). Geological map over St. Bartholomew.

Accompanying "On the geology of the northeastern West India Islands." Kongl. Svenska Vetenskaps-Akademiens Handlingar, Bandet 9, No. 12, Tafl. II. 4°. Stockholm, 1871.

Black etching.

831.

- 1872—Gabb (W. M.). Geological map of the Republic of Santo Domingo. Scale, 12 miles to the inch.

Accompanying "On the topography and geology of Santo Domingo." Trans. Amer. Phil. Soc., New Series, Vol. XV, Article IV, p. 260. 4°. Philadelphia, 1881.

832.

- 1877—Guppy (R. J. L.). Sketch map of the northwestern part of Trinidad.

Accompanying "On the physical geography and fossils of the older rocks of Trinidad." Proceedings of the Scientific Association of Trinidad, Vol. II, p. 115. Port of Spain, 1877.

Black etching.

833.

- 1880—Salterain y Legarra (Pedro). Mapa geológico y topográfico en bosquejo de las jurisdicciones de la Habana y Guanabacoa (Isla de Cuba). Scale, 1 : 200,000.

Accompanying "Apuntes físico-geológicos de la Habana y Guanabacoa." Boletín de la comisión del mapa geológico de España, tomo VII. Lamina D. Madrid, 1880.

An important and well executed map. Published also separately.

(148)

**XX—CENTRAL AMERICA, COMPRISING BRITISH HONDURAS OR  
BELIZE, HONDURAS, GUATEMALA, SALVADOR, NICARA-  
GUA, AND COSTA RICA.**

834.

**1865-1868—Dollfus (Auguste) and de Montserrat (Eugène).** Esquisse  
d'une carte géologique d'une partie des républiques de Guatemala  
et de Salvador (Amérique Centrale). Scale, 1 : 761,000.

Accompanying "Voyage géologique dans les républiques de Guatemala et  
de Salvador." Planche V. 4°. Paris, 1868.

Very important and well executed.

(149)



**XXI.—SOUTH AMERICA IN GENERAL.**

835.

**1842—Orbigny (Alcide d').** Carte de l'Amérique méridionale indiquant ses différentes époques géologiques.

Accompanying "Voyage dans l'Amérique méridionale," tome III, 3<sup>me</sup>, partie: Géologie. Atlas. Planche X. Paris, 1842.

Black etching.

836.

**1856—Foetterle (Franz).** Geologische Übersichts-Karte von Süd-Amerika. Scale, 1:25,000,000.

Accompanying "Die Geologie von Süd-Amerika." Petermann's geographische Mittheilungen, Jahrgang 1856, vol. II, p. 187. Plate 11. 4°. Gotha, 1856.

837.

**1868—Martin de Moussy (V.).** Carte physique de l'Amérique du Sud.

Accompanying "Description géographique et statistique de la Confédération Argentine," 2<sup>me</sup> édition. Atlas. Planche XIX. folio. Paris, 1873.

A compilation of Foetterle and Marcon geological maps of South America and The World.

**XXII.—ECUADOR, COLOMBIA OR NEW GRANADA, AND VENEZUELA.**

838.

- 1839—Degenhardt (Carl).** Plan-Umgegend von El Quarzo der Salzquellen und der Goldseifenwercke. Maasstab von 900 englischen Lachtern à 6 Fuss.

Accompanying "Ueber die Salzquellen des nördlichen Theiles der Provinz Antioquia und die Gebirgsformationen der Umgebung von Medellin im Freistaate von Neu-Grenada." Karsten: Archiv für Mineralogie, etc. Vol. XII. Taf. I. Berlin, 1839.

839.

- 1841—Degenhardt (Carl).** Carte géologique du district de la Baja, province de Pamplona, Colombie.

Accompanying "Monatsberichte über die Verhandlungen der Gesellschaft für Erdkunde zu Berlin." Berlin, 1842.

Not seen.

840.

- 1850—Karsten (Hermann).** Geognostische Karte des nordöstlichen Venezuela.

Accompanying "Beitrag zur Kenntniss der Gesteine des nördlichen Venezuela." In the Zeitschrift der deutschen geologischen Gesellschaft. II. Band. Taf. XI. Berlin, 1850.

841.

- 1850—Anonymous.** Isthmus of Panama; geological coloring.

Accompanying the upper left hand corner of "A new map of Central America, showing the different lines of Atlantic and Pacific communication." Published by J. Disturnel. New York, 1850.

A fancy geological map made for the gold seekers of California, 1849-'50.

842.

- 1852—Taylor (R. C.).** A map of the Rio Palenque, R. Escribanos, R. Valencia, and R. del Rey, in the auriferous porphyry region of the Province of Veraguas and Isthmus of Panama. Scale of  $\frac{1}{8}$  of an inch to a mile.

Accompanying "Substance of notes made during a geological reconnaissance in the auriferous porphyry region next the Caribbean Sea." Journ. Acad. Nat. Sciences of Philadelphia. 4<sup>o</sup>. 2d Series. Vol. II. Article IX, p. 184. Plate X. Philadelphia, 1850-'54

Black, with geological indications.

(151)

843.

**1856—Karsten (Hermann).** Karte der Verbreitung der geognostischen Formationen in Columbien.

Accompanying "Die geognostischen Verhältnisse Neu-Granada's." Verhandlungen der Versammlung deutscher Naturforscher. 4°. Wien, 1856.

844.

**1856—Karsten (Hermann).** Columbien zur Zeit der Kreideformation.

Accompanying "Die geognostischen Verhältnisse Neu-Granada's." Verhandlungen der Versammlung deutscher Naturforscher. 4°. Wien, 1856.

Black etching. This map is on the same sheet with the one previously cited.

845.

**1860—Wall (G. P.).** Maps and sections of the northern part of South America.

Accompanying "On the geology of a part of Venezuela and of Trinidad." Journ. Geol. Soc. London. Vol. XVI, p. 460. London, 1860.

Black etching.

(152)

**XXIII.—GUIANA AND BRAZIL.**

846.

- 1841—Claussen (P.).** Carte géologique d'une partie de la province de Minas Geraes au Brésil.

Accompanying "Notes géologiques sur la province de Minas Geraes au Brésil." Bull. Acad. royal de Bruxelles, tome VIII, No. 5. Bruxelles, 1841.

847.

- 1854—Foetterle (Francisco) and Haidinger (Guilherme).** Golpe de vista geologico do Brezil e de algumas outras partes centraes de America do Sul. Scale 1 : 15,000,000.

Accompanying "Die geologische Uebersichtskarte des mittleren Theiles von Süd-Amerika." Wien, April, 1854.

This map, in Portuguese language, and published with a memoir in German to explain it, was constructed for Prof. Dr. von Martins, of München, for his great work on Brazil.

848.

- 1871—Hartt (C. F.).** Sketch map of vicinity of Monte Alegre and Ereré.

Accompanying "Contributions to the geology and physical geography of the Lower Amazonas," in Bulletin Buffalo's Soc. Nat. Sciences, p. 201. Buffalo, 1871.

Black, with geological indications.

849.

- 1873—Brown (C. Barrington).** Geological map of British Guiana. Scale, one inch to 13.6 geographical miles.

Accompanying "Reports on the physical, descriptive, and economic geology of British Guiana," by C. B. Brown and J. G. Sawkins. London, 1875.

850.

- 1879—Brown (C. Barrington).** Map of a portion of South America, showing the position and extent of the old river-deposit on the Amazon, east of Tabatinga.

Accompanying "On the ancient river-deposit of the Amazon." Jour. Geol. Soc. London, Vol. XXXV, p. 763. Plate XXXVIII. London, 1879.

Black etching.

**XXIV.—PARAGUAY, URUGUAY, REPUBLICA ARGENTINA, PATAGONIA, FALKLAND ISLANDS OR ISLAS MALVINAS, AND TIERRA DEL FUEGO.**

851.

- 1835—Orbigny (Alcide d').** Carte géologique d'une partie de la République Argentine, comprenant les provinces de Corrientes et des Missions.

Accompanying "Voyage dans l'Amérique méridionale"; partie historique. Atlas. Carte No. 3. Paris, 1835.

852.

- 1838—Orbigny (Alcide d').** Carte géologique d'une partie de la République Argentine, comprenant les provinces de Santa Fé, d'Entre-Rios, de Buenos-Aires, et la partie septentrionale de la Patagonie. Scale, 20 lieues au degré.

Accompanying "Voyage dans l'Amérique méridionale"; partie historique. Atlas. Carte No. 1. Paris, 1838.

853.

- 1857—Bravard (Auguste).** Mapa geologico y topografico de los alrededores de Bahia Blanca. Buenos Ayres, 1857.

Unseen. Copied from "Compte rendu de la Société de Géographie de Paris," No. 1, 1884, p. 32, Paris, where the name of the author is given as Ravard.

854.

- 1869—Martin de Moussy (V.).** Carte physique de la Confédération Argentine.

Accompanying "Description géographique et statistique de la Confédération Argentine." Deuxième édition, atlas, planche XX. folio. Paris, 1873.

855.

- 1875—Stelmser (Alfr.).** A geological map of a part of the Argentine Republic.

Accompanying "Boletin de la Academia nacional de ciencias exactas existentes en la universidad," Vol. I. Buenos Ayres, 1875.

Unseen; published by Dr. Burmeister.

856.

- 1876—**Burmeister** (Hermann). Carte géognostique d'une partie de la République Argentine entre les 65°-73° de longitude et 25°-34° de latitude.

Accompanying "Tableau géognostique de la République Argentine. Description physique de la République Argentine." Tome II, livre IV, p. 161. Paris, 1876.

857.

- 1876—**Schickendantz** (Federico). No title. (A small sketch map of a part of the province of Catamarca.)

Accompanying "The natural sulphates of the province of Catamarca." In, The Argentine Republic, by Richard Napp, p. 215. Buenos Aires, 1876. Black, with geological inscriptions.

858.

- 1880—**Lallemant** (G. A.). Los lavaderos y criaderos auríferos.

Accompanying "Notas sobre los lavaderos y criaderos auríferos de los Cerritos Blancos en la sierra de San Luis." Anales de la Sociedad científica Argentina. Tomo IX, Entrega V, p. 208. Buenos Aires, 1880.

Black etching; the text says it is colored, los lavaderos = color de carmin; los cumulos de traquita = color amarillo.

(155)

**XXV.—CHILE, BOLIVIA, AND PERU.**

859.

- 1827—Rivero (M. de).** View and topographical plan of the new town of the hill Pasco, taken from the lake of Quinlacocha.

Accompanying "A sketch of the rich mine of Pasco." Amer. Journ. Silliman. Vol. XV. New Haven, 1829.

This map is colored lithologically in five colors. Translated from Journal of Natural Science and National and Foreign Industry of M. de Rivero. Vol. I, No. 2. Lima, 1828.

860.

- 1840—Domeyko (Ignace).** Esquisse d'une carte géologique de la vallée d'Elqui.

Accompanying "Sur un terrain stratifié situé dans le haut des Cordillères, et sur les silons métallifères qui l'accompagnent." Annales des mines, 3<sup>e</sup> série, Tome XVIII, Pl. II, p. 59. Paris, 1840.

Black etching.

861.

- 1842—Orbigny (Alcide d').** Carte géologique de la République de Bolivia.

Accompanying "Voyage dans l'Amérique méridionale." Tome III, 3<sup>me</sup> partie. Géologie. Atlas. Carte No. 4. Paris, 1842.

The most important geological map on South America, giving data on the geological structure of the Andes, for the first time in geology.

862.

- 1846—Domeyko (Ignace).** Carte géologique et minéralogique du Chili.

Accompanying "Recherches sur la constitution géologique du Chili." Annales des mines, 4<sup>e</sup> série Vol. IX, Planche IV, p. 365. Paris, 1846.

Black etching. The first important and exact geological work on Chili.

863.

- 1848—Domeyko (Ignace).** Carte géologique des environs de Coquimbo.

Accompanying "Sur le terrain tertiaire et les lignes d'ancien niveau de l'Océan du sud, aux environs de Coquimbo (Chili)." Annales des mines, 4<sup>e</sup> série. Vol. XIV, p. 153, Pl. II. Paris, 1848.

Black etching.

864.

- 1848—Domeyko (Ignace).** Carte géologique des environs de la Concepcion.

Accompanying "Sur la composition géologique du Chili, à la latitude de Concepcion, depuis la baie de Talcahuano jusqu'au sommet de la cordillère de Pichachen, comprenant la description du volcan d'Antuco." Annales des mines, 4<sup>e</sup> série. Vol. XIV, pp. 163 et 186. Pl. III. Paris, 1848.

Black etching.

(156)

865.

- 1860—Forbes (David).** Geological sketch map of part of Bolivia and Peru.

Accompanying "Report on the geology of South America, by David Forbes. Part I. Bolivia and Southern Peru, with notes on the fossils, by Huxley, Salter, and Jones." Journ. Geol. Soc. London. Vol. XVII. London, 1861.

An important map, on a very small scale, which corrects some parts of d'Orbigny's map; it is also separately printed.

866.

- 1867—Simonin (Louis).** Carte des terrains métallifères du Chili, d'après Gay et Domeyko.

Accompanying "La vie souterraine, ou les mines et les mineurs." Carte XII, p. 424. Paris, 1867.

867.

- 1868—Concha i Toro (Enrique).** Plano que indica la situacion del Terreno Terciario inferior i cretaceo superior entre los Puertos de Tomé i Leuvu.

Accompanying "Memoria sobre los formaciones cuaternarias, terciarias, i cretácea (superior) de Chile, relativas principalmente a la parte meridional de este pais." Anales de la Universidad de Chile, tomo XXXII, no. 5, p. 390. Santiago de Chile, 1869.

Black etching.

868.

- 1873—Pissis (A.).** Plano topographico y geologico de la Republica de Chile levantado por órden del gobierno, bajo la direccion de A. Pissis. Scale, 1 : 250,000. Paris, 1873.

In 13 sheets. No date nor place of publication, but 1873 may be considered as the exact date of issue, and Paris is the place where it was executed. The map is colored geologically, but a certain number of copies have been issued in black with limit of the rocks in dotted lines, and geological inscriptions with letters.

It is the most important geological map and work published as yet on South America, and is very creditable, both to its author, M. A. Pissis, and the Chilean Government.

869.

- 1873—Pissis (A.).** Carte géologique de la région des Andes entre 22° et 42° Sud. Scale, 1 : 5,000,000.

Accompanying "Mémoire sur la constitution géologique de la chaîne des Andes entre le 16° et le 53° degré de latitude sud." Annales des mines, vol. III, p. 404. Paris, 1873.

A valuable map, giving, on a smaller scale, the results contained in Pissis' large map in 13 sheets.

870.

- 1875—Pissis (A.).** Plano del grupo volcanico de los volcanes del Descabezado (Chile). Scale, 1 : 100,000.

Accompanying "Atlas de la geografía fisica de la República de Chile." Lamina 19. In folio. Paris, 1875.

Explanation of the atlas, in Geografía fisica de la República de Chile, p. 341.

(157)





## SUPPLEMENT.

---

The number between brackets shows the correct position of the map in the general catalogue.

### II.—NORTH AMERICA IN GENERAL.

871 [30*a*].

**1843—Castelnau** (Francis de). Carte théorique de l'Amérique Sept<sup>ale</sup> avant le soulèvement des Illinois. (Epoque silurienne.)

Accompanying "Essai sur le système Silurien de l'Amérique septentrionale." 4°. Pl. I. Paris, 1843.

In black. A very rough sketch map with geological inscriptions only.

872 [59*a*].

**1866—Daddow** (S. H.). Map of the Alleghany coal field.

Accompanying "Coal, iron, and oil; or the practical American miner," p. 318. Pottsville, Pa., 1866.

In black.

873 [59*b*].

**1866—Daddow** (S. H.). Map of the great coal field in Iowa and Missouri.

Accompanying "Coal, iron, and oil; or the practical American miner," p. 377. Pottsville, Pa., 1866.

In black.

874 [59*c*].

**1866—Daddow** (S. H.) and **Bannan** (Benjamin). Great central coal field. (Illinois, Indiana, and western Kentucky.)

Accompanying "Coal, iron, and oil; or the practical American miner," p. 362. Pottsville, Pa., 1866.

In black.

875 [80a].

**1880—Hayden (F. V.).** General geological map of the area explored and mapped by Dr. F. V. Hayden and the surveys under his charge, 1869 to 1880. Scale, 1:2,600,000 or 41.03 miles to 1 inch.

Accompanying "Twelfth annual report of the U. S. Geol. and Geogr. Surv. Territories, for the year 1878." Maps and panoramas in accompanying pocket, sheet XI. Washington, 1883.

This map was issued February, 1884, several months after the report and pocket. It embraces Nebraska, Dakota, Montana, Idaho, Wyoming, Utah, Colorado, and very small portions of New Mexico and Arizona.

876 [80b].

**(1881)—Chamberlin (T. C.).** Geological map of the United States, compiled from various official sources.

Accompanying "Wisconsin geological survey," Vol. I, Part I, Pl. III, p. 79. Madison, 1883.

Black etching. There is no name of author nor date on the map.

(160)

**V.—ACADIA.**

877 [131*a*].

- 1866—Daddow (S. H.) and Bannan (Benjamin).** Maps of the Arcadian Coal fields.

Accompanying "Coal, iron, and oil; or the practical American miner," p. 387. Pottsville, Pa., 1866.

In black. A reduced copy of the map of the New Brunswick, Nova Scotia, Cape Breton, and Newfoundland coal fields, by R. C. Taylor.

See Taylor (R. C.), 1848—No. 121.

**VII.—NEW ENGLAND.**

878 [208*a*].

- 1848—Thompson (Zadock).** Geological map of Vermont.

Accompanying "Geography and geology of Vermont," p. 44. 13°. Burlington, 1848.

Black etching.

(161)

Bull. 7—11

**IX.—PENNSYLVANIA, DELAWARE, AND MARYLAND.**

879 [276*a*].

- 1856—Lesley (J. P.).** No title. (Map intended to exhibit the north-eastern portion of the great eastern coal field of the United States.)

Accompanying "Manual of coal and its topography," 12°, p. 76, fig. 20. Philadelphia, 1856.

Black etching.

880 [276*b*].

- 1856—Lesley (J. P.).** No title. (Map of the region of the Juniata.)

Accompanying "Manual of coal and its topography," 12°, p. 137, fig. 37. Philadelphia, 1856.

In black.

881 [285*a*].

- 1866—Daddow (S. H.) and Bannan (Benjamin).** Map of the Broad Top coal field.

Accompanying "Coal, iron, and oil; or the practical American miner," p. 299. Pottsville, Pa., 1866.

In black.

882 [285*b*].

- 1866—Daddow (S. H.) and Bannan (Benjamin).** Map of Cumberland coal field (Maryland).

Accompanying "Coal, iron, and oil; or the practical American miner," p. 332. Pottsville, Pa., 1866.

In black.

883 [307*a*].

- 1876—Lesley (J. P.) and Frazer (P., jr.).** Geological maps of Adams County.

Accompanying "2d Geol. Surv. Pennsylvania." Adams, Franklin, Cumberland maps, atlas, D. 5. Harrisburg (1883).

884 [324*a*].

- 1878—Lesley (J. P.), Prime (F., jr.), Clark (E., jr.), and Berlin (A. P.).** Geological and Topographical map of a part of Northampton County.

Accompanying "2d Geol. Surv. Pennsylvania." Lehigh, Northampton, and Berks, atlas to D. 3, Vol. I and Vol. II. Harrisburg, 1878.

In six sheets.

885 [343 *a*].

1880—**Frazer** (P., jr.). Geological map of Chester County. Scale, 2 miles to 1 inch.

Accompanying "2d Geol. Surv. Pennsylvania." The geology of Chester County, C. 4. Harrisburg, 1883.

886 [343 *b*].

1880—**Lealey** (J. P.). Geological map of Cumberland County. Scale, 2 miles to 1 inch.

Accompanying "2d Geol. Surv. Pennsylvania." Adams, Franklin, Cumberland maps, atlas D. 5. Harrisburg (1883).

887 [349 *a*].

1881—**Lewis** (H. O.) and **Wright** (G. F.). Map showing the course of the great terminal Moraine across Pennsylvania.

Accompanying "2d Geol. Surv. Pennsylvania." Report on the terminal Moraine in Pennsylvania and Western New York. Report of progress. Z. Harrisburg, 1884.

888 [351 *a*].

1881—**Sanders** (R. H.). Geological map of Franklin County. Scale, 2 miles to 1 inch.

Accompanying "2d Geol. Surv. Pennsylvania." Adams, Franklin, Cumberland, atlas D. 5. Harrisburg (1883).

**XI—ILLINOIS, IOWA, MINNESOTA, AND WISCONSIN.**

889 [528 a].

- 1879—King (F. H.).** Map of a portion of the Upper Flambeau valley showing the position of Archæan exposures.

Accompanying "Wisconsin geological survey," Vol. IV, Part VI, Pl. XII, p. 585. Madison, 1882.

Black, with lithological inscriptions. There is no name of author on the map.

890 [536 a].

- 1881—Chamberlin (T. O.).** General geological map of Wisconsin.

Accompanying "Wisconsin geological survey." Atlas, Vol. IV, folio, Pl. I. Milwaukee, 1882.

891 [536 b].

- 1881—Chamberlin (T. C.).** General map of the Quaternary formations of Wisconsin.

Accompanying "Wisconsin geological survey." Atlas, Vol. IV, folio, Pl. II. Milwaukee, 1882.

892 [536 c].

- 1881—Chamberlin (T. C.).** General geological map of Wisconsin.

Accompanying "Wisconsin geological survey," Vol. I, Part I, Pl. II, p. 64. Madison, 1883.

Black etching. There is no name of author on the map.

893 [536 d].

- (1881)—Irving (R. D.).** Crystalline rocks of the Wisconsin valley (from Pine river to Grandfather Bull falls; sketch map No. VIII). Scale,  $1\frac{1}{2}$  miles to 1 inch.

Accompanying "Wisconsin geological survey," Vol. IV, Part VII, Pl. XXI, p. 702. Madison, 1882.

Black etching and lithological inscriptions. There is no date nor name of author on the map.

894 [536 e].

- (1881)—Irving (R. D.).** Crystalline rocks of the Wisconsin valley (from Junction river to Mosinee; sketch map No. IV). Scale,  $1\frac{1}{2}$  miles to 1 inch.

Accompanying "Wisconsin geological survey," Vol. IV, Part VII, Pl. XVII, p. 650. Madison, 1882.

Black, with lithological inscriptions. There is no date nor name of author on the map.

895 [536 f].

- (1881)—Irving (R. D.). Crystalline rocks of the Wisconsin valley. (Vicinity of Wausau; sketch map No. V.) Scale,  $1\frac{1}{2}$  miles to 1 inch.

Accompanying "Wisconsin geological survey," Vol. IV, Part VII, Pl. XVIII, p. 661. Madison, 1882.

Black, with lithological inscriptions. There is no date nor name of author on the map.

896 [536 g].

- 1881—Irving (R. D.). Crystalline rocks of the Wisconsin valley. (Upper Eau Claire River; sketch map No. VI.) Scale,  $1\frac{1}{2}$  miles to 1 inch.

Accompanying "Wisconsin geological survey," Vol. IV, Part VII, Pl. XIX, p. 686. Madison, 1882.

Black etching and lithological inscriptions. There is no date nor name of author on the map.

897 [536 h].

- 1881—Irving (R. D.). Crystalline rocks of the Wisconsin valley. (Rib River valley above Marathon; sketch map No. VII.) Scale,  $1\frac{1}{2}$  miles to 1 inch.

Accompanying "Wisconsin geological survey," Vol. IV, Part VII, Pl. XX, p. 692. Madison, 1882.

Black etching and lithological inscriptions. There is no date nor name of author on the map.

898 [536 i].

- 1881—Irving (R. D.). Map illustrating the general distribution of the crystalline rocks of the upper Wisconsin valley. Scale, 6 miles to 1 inch.

Accompanying "Wisconsin geological survey," Vol. IV, Part VII, No. 1, p. 625. Madison, 1882.

There is no date nor name of author on the map. By an oversight this map has been numbered No. 1, and is not contained in the list of illustrations, lithographic plates p. xxii.

899 [536 j].

- 1881—Irving (R. D.). Crystalline rocks of the Wisconsin valley. (Vicinity of Grand Rapids; sketch map No. I.) Scale,  $1\frac{1}{2}$  miles to 1 inch.

Accompanying "Wisconsin geological survey," Vol. IV, Part VII, Pl. XIV, p. 627. Madison, 1882.

There is no date nor name of author on the map. It is also numbered No. I, like the preceding map.

See Irving (R. D.), 1881—No. 898.



900 [536*k*].

- 1881—Irring (R. D.). Crystalline rocks of the Wisconsin valley.  
(Vicinity of Stevens Point; sketch map No. II.)  
Accompanying "Wisconsin geological survey," Vol. IV, Part VII, Pl. XV,  
p. 639. Madison, 1882.  
There is no date nor scale nor name of author on the map.

901 [536*l*].

- 1881—Irring (R. D.). Crystalline rocks of the Wisconsin valley.  
(Yellow River; sketch map No. III.) Scale,  $1\frac{1}{2}$  miles to 1 inch.  
Accompanying "Wisconsin geological survey," Vol. IV, Part VII, Pl. XVI,  
p. 645. Madison, 1882.  
There is no date nor name of author on the map.

(166)

## **XII—SOUTHERN STATES, ETC.**

902 [582*a*].

- 1866—Daddow (S. H.).** Map of the Richmond and Piedmont coal fields (Virginia.)

Accompanying "Coal, iron, and oil; or the practical American miner" 395. Pottsville, Pa., 1866.

In black.

903 [582*b*].

- 1866—Daddow (S. H.).** Dan River and Deep River coal fields. (Virginia and North Carolina.)

Accompanying "Coal, iron, and oil; or the practical American miner" 404. Pottsville, Pa., 1866.

In black.

904 [582*d*].

- 1866—Daddow (S. H.) and Bannan (Benjamin).** Map of the Kanawha valley and the iron regions at the head of the Kanawha River. Scale, fifty miles to an inch.

Accompanying "Coal, iron, and oil; or the practical American miner" 346. Pottsville, Pa., 1866.

In black.

905 [582*e*].

- 1866—Daddow (S. H.) and Bannan (Benjamin).** Map of the New River coal fields. (Virginia.)

Accompanying "Coal, iron, and oil; or the practical American miner" 407. Pottsville, Pa., 1866.

In black.

906 [582*f*].

- 1866—Daddow (S. H.) and Bannan (Benjamin).** The Alleghany coal field in Alabama.

Accompanying "Coal, iron, and oil; or the practical American miner" p. 355. Pottsville, Pa., 1866.

In black.

907 [590*a*].

- 1871—Lealey (J. P.).** Scott's mine at (b) on Middle Creek, Buchanan County.

Accompanying "The geological structure of Tazewell, Russell, and Buchanan counties in Virginia." Proc. Amer. Phil. Soc., Vol. XII, p. 500, Philadelphia, 1873.

Small black sketch, with lithological indications.

908 [612a].

- 1881—Crandall (A. R.). Kentucky geological survey. Elliot County.  
Scale, 2 miles = 1 inch. (New York, 1881.)

No date nor place of publication on the map.

909 [612b].

- 1881—Fales (J. C.) and Linney (W. M.). Kentucky geological survey.  
Boyle and Mercer counties. Geology of Boyle County, by J. C.  
Fales. Geology of Mercer County, by W. M. Linney. Scale,  
2 miles = 1 inch. (New York, 1881.)

No date nor place of publication on the map.

910 [613a].

- 1881—Linney (W. M.). Kentucky geological survey. Garrard County.  
Scale, 2 miles = 1 inch. (New York, 1881.)

No date nor place of publication on the map.

911 [613b].

- 1881—Linney (W. M.). Kentucky geological survey. Lincoln County.  
Scale, 2 miles = 1 inch. (New York, 1881.)

No date nor place of publication on the map.

912 [613c].

- 1881—Linney (W. M.). Kentucky geological survey. Spencer and  
Nelson Counties. Scale, 2 miles = 1 inch. (New York, 1881.)

No date nor place of publication on the map.

913 [613d].

- 1881—Linney (W. M.) and Knott (W. T.). Kentucky geological sur-  
vey. Washington and Marion counties. Geology of Washing-  
ton County, by W. M. Linney. Geology of Marion County, by  
W. T. Knott. Scale, 2 miles = 1 inch. (New York, 1881.)

No date nor place of publication on the map.

914 [613e].

- 1881—Proctor (J. R.). Map of Kentucky from the Eclectic geographies.  
Scale, natural size as 1 to 1,679,000;  $26\frac{1}{2}$  miles to the inch.

Accompanying "Kentucky geological survey." New series. Kentucky Bu-  
reau für Geologie und Einwanderung. Die materiellen Verhältnisse und  
Vortheile für Einwanderer im Staate Kentucky. Zweite Auflage. Frank-  
fort, Ky., 1881.

Black etching and geological indications. This map was also published in  
the same work in English and in Scandinavian, neither of which have we  
been able to see.

915 [613f].

- 1881—Proctor (J. R.). Map of Kentucky from the Eclectic geographies.  
Scale, natural size as 1 to 1,679,000;  $26\frac{1}{2}$  miles to the inch.

There is no date nor place of publication on the map, but the copyright is  
dated 1882. The map is published separately, having some statistics printed  
on the back, by the Kentucky geological survey and bureau of immigration.  
With the exception of the geological coloring it is the same as map No. 914.

**XIII—NORTHWESTERN STATES AND TERRITORIES.**

916 [636*a*].

- 1878—Endlich (F. M.).** (Geological map of) Part of Central Wyoming. Scale, 4 miles to 1 inch, or 1 : 253,440.

Accompanying "Twelfth annual report of the U. S. Geol. and Geogr. Surv. Territories for the year 1878." Maps and panoramas in accompanying pocket, sheet 3. Washington, 1883.

917 [636*b*].

- 1878—Hayden (F. V.) and Holmes (W. H.).** Preliminary geological map of the Yellowstone National Park. Scale, 2 miles to 1 inch, or 1 : 126,720.

Accompanying "Twelfth annual report of the U. S. Geol. and Geogr. Surv. Territories for the year 1878." Maps and panoramas in accompanying pocket, sheet 6. Washington, 1883.

918 [636*c*].

- 1878—Holmes (W. H.).** No title. (Map showing displacements, Yellowstone valley.)

Accompanying "Report on the geology of the Yellowstone National Park." U. S. Geol. and Geogr. Surv. Territories; twelfth annual report for the year 1878. In two parts. Part II, Pl. III, p. 6. Washington, 1883.

Black etching and geological indications. The title is in the list of illustrations.

919 [636*d*].

- 1878—Holmes (W. H.).** Sketch map of the geology of Junction valley (National Park).

Accompanying "Report on the geology of the Yellowstone National Park." U. S. Geol. and Geogr. Surv. Territories; twelfth annual report for the year 1878. In two parts. Part II, Pl. XXII, p. 42. Washington, 1883.

Black etching.

920 [636*e*].

- 1878—Holmes (W. H.).** Distribution of Glacial boulders (National Park).

Accompanying "Report on the geology of the Yellowstone National Park." U. S. Geol. and Geogr. Surv. Territories; twelfth annual report for 1878. In two parts. Part II, Pl. XXX, p. 52. Washington, 1883.

Black etching and geological indications.

## 921 [636f].

- 1878—Peale (A. C.), St. John (Orestes), and Endlich (F. M.). Geological map of portions of Wyoming, Idaho, and Utah. Scale, 8 miles to 1 inch.

Accompanying "Twelfth annual report of the U. S. Geol. and Geogr. Surv. Territories, for the year 1878." Maps and panoramas in accompanying pocket, sheet 2. Washington, 1883.

## 922 [636g].

- 1878—Peale (A. C.). (Geological map of) Parts of Western Wyoming, Southeastern Idaho, and Northeastern Utah. Scale, 4 miles to 1 inch, or 1 : 253,440.

Accompanying "Twelfth annual report of the U. S. Geol. and Geogr. Surv. Territories, for the year 1878." Maps and panoramas in accompanying pocket, sheet 5. Washington, 1883.

## 923 [636h].

- 1878—St. John (Orestes). (Geological map of) Parts of Western Wyoming and Southeastern Idaho. Scale, 4 miles to 1 inch, or 1 : 253,440.

Accompanying "Twelfth annual report of the U. S. Geol. and Geogr. Surv. Territories, for the year 1878." Maps and panoramas in accompanying pocket, sheet 4. Washington, 1883.

**XVI—CENTRAL WESTERN STATES AND TERRITORIES, ETC.**

924 [763*a*].

**1877—Scudder (S. H.).** The Tertiary lake basin at Florissant, Colorado.  
Scale, 1 mile to 1 inch.

Accompanying "The Tertiary lake basin at Florissant, Colo., between South and Hayden's Parks," U. S. Geol. and Geogr. Surv. Territories; twelfth annual report, for the year 1878. In two parts. Part I, p. 293. Washington, 1883.

Black etching. Reprinted, with additions and alterations, from the Bulletin U. S. Geol. and Geogr. Surv. Territories, Vol. VI, p. 279. Washington, February, 1881.

See Scudder (S. H.), 1881—No. 778.

(171)



## INDEX OF AUTHORS AND PLACES.

- Abbeville, South Carolina, 576, 579.  
 Abbot, H. L., 57.  
 Abbott, C. C., 261.  
 Abb's Valley, Virginia, 590.  
 Acadia, 111-160, 877.  
 Adams County, Ohio, 354.  
 Adams County, Pennsylvania, 295, 296.  
 Adams County, Wisconsin, 491.  
 Addington County, Ontario, Canada, 187.  
 Aguas Calientes, 818.  
 Alabama, 547, 552, 602, 906.  
 Alabama counties:  
     Fayette, 606.  
     Marion, 603.  
     Walker, 604.  
     Winston, 605.  
 Albert coal mines, New Brunswick, 123.  
 Albert County, New Brunswick, 123, 129, 151.  
 Alger, Francis, 111, 113, 115.  
 Alleghany, 64, 350, 351.  
 Alleghany coal field, 872, 900.  
 Alleghany County, North Carolina, 572.  
 Allegheny County, Pennsylvania, 304, 312.  
 Allegheny Valley, Pennsylvania, 339.  
 Altoon, Pennsylvania, 336.  
 Amazon River, 850.  
 America, 1-23.  
 America, northernmost parts, 84, 85.  
 America, northwest coast, 669.  
 American River, California, 681.  
 Ammonoosuc, New Hampshire, 222, 230.  
 Anderson, South Carolina, 578.  
 Andrews, E. B., 435.  
 Anthony's Creek Reservoir, Virginia, 550.  
 Anticosti Island, 165.  
 Antigonish County, Nova Scotia, 122.  
 Antigua, 815.  
 Antioquia, 838.  
 Antisell, Thomas, 677, 780.  
 Andes Mountains, 809.  
 Apostle Island, Wisconsin, 581.  
 Appalachian, 58.  
 Aquidneck Island, 212.  
 Arcadian coal fields, 877.  
 Arctic archipelago, 87.  
 Arctic regions, 83.  
 Arctic Sea, 86.  
 Argenteuil County, Canada, 172, 179.  
 Argentina, 851, 852, 854-856.  
 Arizona, 744, 761, 784, 796, 794-796, 875.  
 Arkansas River, 784.  
 Armstrong County, Pennsylvania, 330, 344.  
 Ashburner, C. A., 316-320, 330, 336, 347, 348.  
 Ashe County, North Carolina, 572.  
 Ashland County, Ohio, 432.  
 Ashland County, Wisconsin, 458, 476, 492, 506, 530  
     531.  
 Ashtabula and New Lisbon Railroad, Ohio, 374.  
 Ashtabula County, Ohio, 396.  
 Atlantic, 137.  
 Avalon Peninsula, Newfoundland, 109.  
 Bechehewahung River, Canada, 184.  
 Baddeley, F. F., 112, 161.  
 Bad Lands, Nebraska, 617, 618.  
 Bad River, Wisconsin, 474, 516.  
 Bahia Blanca, Argentine, 853.  
 Bailey, L. W., 127-130, 151, 159.  
 Baja, Colombia, 839.  
 Baker's Park, Colorado, 741.  
 Bannan Benjamin, 874, 877, 881, 882, 904-906.  
 Baptism River, Minnesota, 462.  
 Barbadoes, 816.  
 Barcoena Mariano, 811-814.  
 Barroso, A., 808.  
 Barlow, S., 170.  
 Barrow County, Wisconsin, 500.  
 Bartholomew County, Indiana, 445.  
 Barton County, Missouri, 728.  
 Barton, D. W., 233.  
 Bay East River, Newfoundland, 102.  
 Bayfield County, Wisconsin, 530, 531.  
 Bay Portage, Canada, 656.  
 Bear River, California, 686.  
 Beaver Bay, Minnesota, 464.  
 Beaver County, Pennsylvania, 305.  
 Beaver River, Pennsylvania, 336.  
 Becker, G. F., 774.  
 Bedford County, Pennsylvania, 349-351.  
 Belfast, Maine, 220.  
 Bell, Robert, 659, 662, 665.  
 Belvie Bay, Newfoundland, 101.  
 Berkshire County, Massachusetts, 197.  
 Berlin, A. P., 1, 884.  
 Big Quinneec Falls, Wisconsin, 519.  
 Bigsby, J. J., 638, 639.  
 Bird, G. G., 633, 634.  
 Black Hills, Dakota, 622, 632, 637.  
 Black Log Mountain, Pennsylvania, 317, 319, 330.  
 Black River Falls (lower), Wisconsin, 511.  
 Black River, Wisconsin, 475.  
 Black Warrior River, Alabama, 607.  
 Blair County, Pennsylvania, 298, 349-351.  
 Blake, W. P., 65, 67, 70, 72, 76, 77, 671-679, 781, 782.  
 Bolivia, 861, 865.



- Bonne Chere River, Canada, 166, 175.  
 Bonnycastle, Fir R. H., 98.  
 Book Cliffs, Colorado, 758.  
 Borden, W. W., 389.  
 Boston, Massachusetts, 194, 204, 237.  
 Boné Ami, 1, 5, 6.  
 Bowie, A. J., jr., 684, 685.  
 Bowman, A., 681, 696, 687.  
 Boyd, E. F., 73, 74, 299-302.  
 Boyle County, Kentucky, 909.  
 Bradford County, Pennsylvania, 310.  
 Bradley, F. H., 75, 690.  
 Braintree, Massachusetts, 227.  
 Bravard, 853.  
 Brazil, 846, 847.  
 Briggs, Newfoundland, 110.  
 Bristol, Rhode Island, 209.  
 British Columbia, 658, 660, 666, 668.  
 British Guiana, 849.  
 British North America, 51.  
 British provinces, North America, 40, 46, 48-50, 55, 59, 66.  
 Britton, N. L., 362.  
 Broadhead, G. C., 709, 725-732.  
 Broad Top coal field, Pennsylvania, 881.  
 Brooks, T. B., 381, 386, 387, 399, 518, 519-527.  
 Brown, C. B., 821, 849, 850.  
 Brown County, Wisconsin, 486, 488.  
 Brown, Richard, 141, 142.  
 Brown, R. T., 443.  
 Brulé River (lower), Wisconsin, 525.  
 Brush Mountain, Pennsylvania, 293.  
 Buch, Leopold, 3, 39.  
 Buenos Ayres (Argentina), 852.  
 Buffalo County, Wisconsin, 532.  
 Burgess (North), Canada, 188.  
 Burkhart, J., 802, 803.  
 Burlingame, E. H., 331.  
 Burmeister, H., 856.  
 Burnett County, Wisconsin, 500, 530.  
 Burrard Inlet, British Columbia, 660.  
 Burt, W. A., 356, 358.  
 Butler County, Ohio, 427.  
 Butler County, Pennsylvania, 303, 337-339.  
 Calhoun's Mill, S. C., 576.  
 California, 61, 670, 676-678, 682, 693, 746.  
 California counties:  
     El Dorado, 693.  
     Placer, 693.  
     Plumas, 691.  
     Sierra, 691.  
 Calumet County, Wisconsin, 488.  
 Camp Baker, Montana, 633.  
 Canada, 24, 34, 35, 41-45, 59, 75, 162, 182, 226.  
 Canada counties:  
     Addington, Ontario, 187.  
     Argenteuil, 172, 179.  
     Frontenac, Ontario, 187.  
     Hastings, Ontario, 187.  
     Lanark, Ontario, 189.  
     Leeds, Ontario, 189.  
     Ottawa, 172, 179, 190.  
     Peterborough, Ontario, 187.  
     Renfrew, Ontario, 189.  
     Terrebonne, 179.  
     Two Mountains, 179.  
 Cañada de las Uvas, California, 679.  
 Canada East, 185, 182.  
 Canada, Western, 191, 646.  
 Canoe Valley, Pennsylvania, 350, 351.  
 Cañon Creek, California, 696, 691.  
 Cape Breton County, Nova Scotia, 159.  
 Cape Breton, Nova Scotia, 114, 121, 121, 134, 141, 145, 148, 149, 153, 154, 156.  
 Cape Dauphin, Nova Scotia, 148.  
 Cape Girardeau County, Missouri, 721.  
 Carleton, New Brunswick, 136, 182.  
 Caril, J. F., 332.  
 Carroll County, Virginia, 572.  
 Castelnau, Francis de, 871.  
 Castillo, Antonio del, 869.  
 Catamarca, Argentina, 857.  
 Catakills, 233.  
 Cattaraugus County, New York, 339.  
 Ceboruco, Mexico, 812.  
 Cedar County, Missouri, 727.  
 Cedar River, Minnesota, 484.  
 Central City, Colorado, 719.  
 Central Ohio Railroad, 433.  
 Centre County, Pennsylvania, 296.  
 Chalk Bluffs, California, 686.  
 Chamberlin, T. C., 485-491, 876, 890-892.  
 Champaign County, Ohio, 425.  
 Chance, H. M., 332-334, 337-339.  
 Chaudière River, Canada, 186.  
 Chazy, New York, 162, 236, 238, 239.  
 Chemung, New York, 239.  
 Chester County, Pennsylvania, 279.  
 Chesterfield, South Carolina, 557, 571.  
 Chester, South Carolina, 555, 569.  
 Chestnut Ridge, Pennsylvania, 314, 315.  
 Chico creek, California, 682.  
 Chihuahua, 34.  
 Chile, 862, 866, 868.  
 Chippewa County, Wisconsin, 500, 532.  
 Chippewa Lands, Wisconsin, 451.  
 Chocolate River, Michigan, 369.  
 Cist, Z., 269.  
 Clarendon, Jamaica, 820.  
 Clarion County, Pennsylvania, 334.  
 Clark County, Indiana, 389.  
 Clark County, Missouri, 724.  
 Clark County, Wisconsin, 477.  
 Clark, E., jr., 294, 884.  
 Clarke County, Ohio, 398.  
 Claussen, P., 846.  
 Cleveland, Parker, 28.  
 Cleve, P. T., 823-830.  
 Clinch River, Virginia, 587-589.  
 Clinton County, New York, 238.  
 Clinton County, Pennsylvania, 333.  
 Coast Range, California, 677.  
 Cochran, 291.  
 Cockburn island, Canada, 184.  
 Cooke County, Tennessee, 543.  
 Collett, John, 390, 437, 438, 441, 442.  
 Colombia (New Granada), 839, 843, 844.  
 Colorado, 80, 733-735, 741, 745, 755, 757-768, 773, 799, 799, 801, 875, 924.  
 Colorado River, California, 676.  
 Colorado Springs, Colorado, 733.  
 Columbia County, Wisconsin, 491.

- Columbus, Wisconsin, 507.  
 Commonwealth, Wisconsin, 523.  
 Comox, British Columbia, 650, 651, 660.  
 Comstock, T. B., 631.  
 Concepcion, Chile, 864.  
 Concepcion Bay, Newfoundland, 110.  
 Concha i Toro Enrique, 867.  
 Connecticut, 193, 205.  
 Connecticut River, 193.  
 Connecticut Valley, 210, 211.  
 Connecticut, Western, 260.  
 Cook, G. H., 246-253, 255, 256, 263.  
 Cooper County, Missouri, 690.  
 Cooper Island, Washington, 823.  
 Coosa, Alabama, 597.  
 Copper Harbor, Michigan, 355.  
 Coquimbo, Chile, 863.  
 Corbincan, A. Rémond de, 690.  
 Cormack, W. E., 97.  
 Cornwall, Pennsylvania, 280.  
 Cortlandt, Western New York, 257, 265, 268.  
 Coshocton County, Ohio, 432.  
 Cove, New York, 268.  
 Cossena, S., 241.  
 Cowitchin, British Columbia, 660.  
 Crandall, A. R., 908.  
 Crasee, C. W.  
 Crawford County, Ohio, 410.  
 Crawford County, Pennsylvania, 346.  
 Crawford County, Wisconsin, 493, 496.  
 Credner, Herman, 64, 245, 254, 382.  
 Crosby, W. O., 227.  
 Cruger, New York, 268.  
 Cuba, 818, 833.  
 Cumberland coal field, 832.  
 Cumberland County, Pennsylvania.  
 Cumberland Lake, Canada, 652.  
 Currey, R. O., 572.  
 Cuyahoga County, Ohio, 392.  
 Daddow, S. H., 872-874, 877, 881, 882, 902-906.  
 Dakota, 56, 623, 626, 637, 875.  
 Dalson, A. F., 277.  
 Dana, E. S., 633, 634.  
 Dana, J. D., 257-260, 264-268.  
 Dana, J. F., 194.  
 Dana, S. L., 194.  
 Dane County, Wisconsin, 490, 494.  
 Dan River, Virginia, 896.  
 Davidson County, Tennessee, 545.  
 Dawson, G. M., 653-656, 658, 663, 664, 666-668.  
 Dawson, J. W., 118-120, 124, 125, 133-135, 143-145, 157, 191, 192.  
 Deep River, North Carolina, 553, 896.  
 Defiance County, Ohio, 408.  
 Degenhart, Carl, 833, 839.  
 De la Beche, H. T., 817.  
 Delaware County, Indiana, 444.  
 Delaware County, Ohio, 412.  
 Denver, Colorado, 712.  
 Descabezado, Chile, 870.  
 Devil's Lake Gorge, Wisconsin, 495.  
 Devine, T., 640.  
 Dewey, C., 195, 197.  
 Dodge County, Minnesota, 481.  
 Dodge County, Wisconsin, 487, 488, 491.  
 Dollfus, A., 806, 807, 834.  
 Dolores River, Colorado, 754.  
 Domeyko, Ignacio, 860, 862-864.  
 Door County, Wisconsin, 486.  
 Douglas County, Wisconsin, 530.  
 Drummond Island, Canada, 184.  
 Duncan, P. W., 820.  
 Dunn County, Wisconsin, 506.  
 Dutchess County, New York, 260.  
 Dutch Flat, California, 686.  
 Dutton, C. E., 773, 775.  
 Eagle River, Colorado, 736.  
 Eagle River, Michigan, 397.  
 Eagle, Wisconsin, 523.  
 East Broad Top coal basin, Pennsylvania, 330.  
 East Broad Top Railroad, Pennsylvania, 317, 319.  
 Eastern Canada, 185, 192.  
 Eastern Iowa, 455.  
 Eastern Kentucky, 591, 598.  
 Eastern Ohio, 383, 440.  
 Easton, Pennsylvania, 270.  
 East Tennessee, 541, 543.  
 Eaton, Amos, 234.  
 Eau Claire County, Wisconsin, 532.  
 Eau Claire River, Wisconsin, 889.  
 Egloffstein, Baron F. W., 805.  
 El Dorado County, California, 693.  
 Elk Mountains, Colorado, 735, 738.  
 Elliot County, Kentucky, 906.  
 Ella, R. W., 151, 152, 159.  
 Elqui, Chile, 860.  
 Elrod, M. N., 445.  
 Emerson, L. G.  
 Emmons, Ebenetzer, 237-239, 553.  
 Emmons, S. F., 704, 752, 776.  
 Engelman, H., 460.  
 Endlich, F. M., 710, 711, 741-743, 916, 921.  
 Entre-Rios, Argentine, 852.  
 Erie County, Ohio, 405.  
 Erie County, Pennsylvania, 346.  
 Eureka, Nevada, 777.  
 Evans, John, 617, 618.  
 Fales, J. C., 909.  
 Fall of Saint Anthony, Minnesota, 503.  
 Fayette County, Alabama, 606.  
 Fayette County, Pennsylvania, 314, 328.  
 Feilden, H. W., 94.  
 Fillmore County, Minnesota, 483.  
 Finch, J., 270.  
 Flambeau Valley, Wisconsin, 889.  
 Fletcher, H., 148, 149, 153, 154, 158.  
 Florida, 615.  
 Florissant, Colorado, 778, 924.  
 Floyd County, Indiana, 389.  
 Floyd County, Virginia, 572.  
 Foetterle, Franz, 836, 847.  
 Fond du Lac County, Wisconsin, 488.  
 Forbes, David, 865.  
 Forest City, California, 690.  
 Fort Edmonton, British Columbia, 666.  
 Fort Tejon, California, 682.  
 Fortieth parallel, 635, 636, 750-752, 764-771.  
 Forty-ninth parallel, 654.  
 Foster, J. W., 63, 364-369.  
 Fountain County, Indiana, 443.  
 Four Foot Falls, Wisconsin, 521.  
 Four Lake, Wisconsin, 494.

- Fox River, Wisconsin, 491.  
 Franklin County, Missouri, 696.  
 Franklin County, Ohio, 429.  
 Franklin County, Pennsylvania, 888.  
 Frazer, P., jr., 295, 298, 321, 323, 335, 341, 363, 385.  
 Frazer River, British Columbia, 658.  
 Freeborn County, Minnesota, 478.  
 Freeman, H. C., 465.  
 Frontenac County, Ontario, Canada, 187.  
 Fulton County, Pennsylvania, 320.  
 Gabb, W. M., 331.  
 Gaines, Pennsylvania, 290.  
 Galeotti, H. G., 804.  
 Gallatin River, Montana, 629.  
 Gander Lake, Newfoundland, 106.  
 Gander River, Newfoundland, 106.  
 Garrard County, Kentucky, 910.  
 Gaspé, Canada, 169, 174, 183.  
 Genesee, New York, 239.  
 Georgia, 541, 548.  
 Georgia, Gulf of, British Columbia, 648.  
 Georgia, Strait of, British Columbia, 651.  
 Georgia, Vermont, 226.  
 Gerolt, Baron Frederick von, 805.  
 Gesner, Abraham, 114, 116, 117.  
 Gibara, Cuba, 818.  
 Gibb, G. D., 175-178.  
 Gibeonville, California, 683.  
 Gilbert, G. K., 435, 585, 746-749, 759, 791, 793-796, 798.  
 Gilpin, E., 105, 146, 147, 155, 156, 160.  
 Ginger Island, West Indies, 823.  
 God's Lake, Canada, 665.  
 Godthaab, Greenland, 96.  
 Gold Run, California, 686.  
 Goodyear Creek, California, 691.  
 Goodyear, W. A., 681.  
 Grandfather Bull Falls, Wisconsin, 886.  
 Grand Cañon of the Colorado River, 775, 784, 793.  
 Grand Manan Island, New Brunswick, 130.  
 Grand Manitoulin Island, Canada, 184.  
 Grand Marais, Wis., 539.  
 Grand Rapids, 892.  
 Grand River, Colorado, 740, 753.  
 Grand Traverse, Michigan, 379.  
 Grant County, Wisconsin, 498.  
 Grayson County, Virginia, 572.  
 Great Aughwick Valley, Pennsylvania, 317.  
 Great Bræ d'Or Cape Breton Island, 153.  
 Great Salt Lake, 750.  
 Green County, Ohio, 407.  
 Green County, Pennsylvania, 329.  
 Green County, Wisconsin, 490.  
 Green, G. K., 439.  
 Greenhorn Creek, California, 686.  
 Green Lake County, Wisconsin, 461.  
 Greenland, 90-96.  
 Green River Basin, Wyoming, 636, 717.  
 Greenville, South Carolina, 578.  
 Green, W., jr., 58, 284.  
 Grenville, Canada, 164.  
 Grewingk, C., 669.  
 Grinnell Land, 94.  
 Grönland-Nord, 80, 91, 93.  
 Grönland-Syd, 92.  
 Guanabacoa, Cuba, 833.  
 Guatemala, 834.  
 Guettard, J. E., 24.  
 Gulf of Georgia, British Columbia, 648.  
 Gunnison River, Colorado, 737, 739, 740, 744.  
 Guppy, R. J. L., 832.  
 Habana, Cuba, 833.  
 Hagar, A. D., 212, 214.  
 Hague, Arnold, 705, 752, 777.  
 Haidinger, G., 847.  
 Halifax, 137.  
 Hall, James, 32, 52, 239, 455.  
 Hamilton, New York, 239.  
 Hampshire County, Massachusetts, 199.  
 Hancock County, Ohio, 417.  
 Harden, E. B., 349.  
 Hardin County, Illinois, 460.  
 Hardin County, Ohio, 416.  
 Hare's Valley, Pennsylvania, 317.  
 Harper, L., 559-564.  
 Harrington, M. W., 480-482.  
 Hartley, E., 138.  
 Hartt, C. F., 848.  
 Hastings County, Ontario, Canada, 187.  
 Haughton, S., 86, 87.  
 Hawes, G. W., 232.  
 Hayden, F. V., 56, 619-623, 626-630, 723, 734, 737-763, 875, 917.  
 Hector, J., 641, 644-648.  
 Healdy, E., 131.  
 Heinrich, O. J., 601, 610.  
 Helderberg, New York, 239.  
 Hendel, C. W., 683, 692.  
 Henley Island, Canada, 177.  
 Hennepin County, Minnesota, 503.  
 Henry County, Ohio, 420.  
 Henry Mountains, Utah, 756.  
 Heron, J., 235.  
 Hidalgo, Mexico, 814.  
 Higgins, S. W., 359.  
 Highland County, Ohio, 406.  
 Highgate Springs, Vermont, 185, 236.  
 Hildreth, S. P., 853.  
 Hilgard, E. W., 81, 575, 787, 798.  
 Hill, F. C., 425, 435.  
 Hind, H. Y., 137, 642, 643.  
 Hitchcock, C. H., 65, 67, 69, 70, 76, 77, 82, 213, 215-225, 228-231.  
 Hitchcock, E., 4, 41, 42, 72, 193, 196, 198, 200-202, 204, 206, 209-211, 215, 216.  
 Hitchcock, E., jr., 215, 216.  
 Holmes County, Ohio, 432.  
 Holmes, W. H., 733, 735, 917-920.  
 Honeyman, D., 132.  
 Hopkins, F. V., 785, 786.  
 Hotchkiss, Jed., 592, 608, 614.  
 Hot Springs, Colorado, 714.  
 Houghton, Douglas, 337.  
 Houston County, Minnesota, 501.  
 Howard County, Missouri, 730.  
 Howard Hill, Pennsylvania, 277.  
 Howell, E. E., 746-749, 793, 796, 798, 799.  
 Howley, J. P., 104, 107-110.  
 Hubbard, Bela, 359, 360.  
 Hudson's Bay territory, 683, 640, 688, 692.  
 Huétamo, Mexico, 862.  
 Humphreys, A. A., 57.

- Huntingdon County, Pennsylvania, 296, 316-320, 349-351.  
 Huntingdon Township, Pennsylvania, 303.  
 Hunt's Hill, California, 686.  
 Huron County, Ohio, 431.  
 Idaho, 875, 915-917.  
 Iglesias, M., 812.  
 Illinois, 37, 448-450, 456, 459, 461, 484, 528, 874.  
 Independence, Missouri, 36.  
 Indiana, 378, 437, 438, 441, 606, 874.  
 Indiana County, Pennsylvania, 324.  
 Indiana counties:  
   Bartholomew, 445.  
   Clark, 389.  
   Delaware, 444.  
   Floyd, 389.  
   Fountain, 443.  
   Lawrence, 390.  
   Munroe, 439.  
   Putnam, 438.  
   Shelby, 442.  
 Iowa, 37, 749-451, 455, 459, 467, 468, 470, 528, 878.  
 Iowa County, Wisconsin, 490, 498.  
 Iron Lake, Wisconsin, 539.  
 Iron Mountain, Missouri, 702.  
 Ironton, Pennsylvania, 325.  
 Irving, R. D., 473-475, 477, 490-497, 504-508, 515, 516, 528, 531, 534, 535, 893-901.  
 Isbister, A. K., 84, 85.  
 Ishpeming, Michigan, 446.  
 Island Lake, Canada, 666.  
 Island of Anticosti, 165.  
 Island of Aquidneck, 213.  
 Islands, Ohio, 406.  
 Isle La Motte, Vermont, 215, 226.  
 Isle Royale, Lake Superior, 363, 365, 373, 447.  
 Ives, 360.  
 Jacala, Mexico, 814.  
 Jackson County, Wisconsin, 475, 477, 498.  
 Jackson, C. T., 111, 113, 115, 123, 203, 207, 208, 862, 363.  
 Jamaica, 817, 820, 821.  
 James, E., 29.  
 Jasper County, Missouri, 726.  
 Jefferson County, Missouri, 723.  
 Jefferson County, New York, 237.  
 Jefferson County, Pennsylvania, 345.  
 Jefferson County, Wisconsin, 487.  
 Johnston, K., 6.  
 Jorulle, Mexico, 802.  
 Judith River, Montana, 621.  
 Jukes, J. B., 99, 100.  
 Julianehaabs, 92.  
 Julien, A. A., 822.  
 Junction River, Wisconsin, 887.  
 Junction River, National Park, 911.  
 Juneau County, Wisconsin, 491, 493.  
 Juniata region, Pennsylvania, 890.  
 Kanawha Valley, 904.  
 Kansas, 56, 623, 772.  
 Karsten, Herman, 840, 843, 844.  
 Kenosha County, Wisconsin, 487.  
 Kentucky, 581, 591, 594, 596, 598-600, 608, 613, 874, 908-915.  
 Kentucky counties:  
   Boyle, 909.  
   Elliott, 908.  
   Garrard, 910.  
   Lincoln, 911.  
   Marion, 913.  
   Mercer, 909.  
   Nelson, 912.  
   Spencer, 912.  
   Washington, 913.  
 Kerr, W. C., 593.  
 Ke-shik-on-se-kan, Minnesota, 464.  
 Kewaunee County, Wisconsin, 496, 498.  
 Keweenaw Point, 392, 394, 399, 371, 373, 424, 594.  
 Key of Sombrero, West Indie, 622.  
 King, Clarence, 635, 696, 704, 750, 753, 764-771.  
 King, F. H., 889.  
 Kings County, New Brunswick, 128, 129.  
 Kishacoquillas Valley, Pennsylvania, 274.  
 Kloos, J. H., 469-587.  
 Knott, W. T., 913.  
 Knox County, Ohio, 482.  
 Koch, F. C. S., 370.  
 Kochler, H., 273.  
 Kornerup, A., 95, 96.  
 Labrador, 88, 89.  
 Lackawanna, Pennsylvania, 284.  
 Lackawanna County, Pennsylvania, 353.  
 La Crosse County, Wisconsin, 493.  
 Ladd, J. B.  
 La Fayette County, Wisconsin, 490, 498.  
 Lake Bonneville, Utah, 748.  
 Lake Champlain, 185, 226.  
 Lake County, Colorado, 776.  
 Lake Eliza, Wisconsin, 534.  
 Lake, Geauga County, Ohio, 398.  
 Lake Huron, 167, 168, 184.  
 Lake Michigan, 368.  
 Lake of the Woods, Manitoba, 638, 655, 656.  
 Lake Passaic, New Jersey, 255.  
 Lake Quilacocha, Peru, 859.  
 Lake St. John, Canada, 161, 171.  
 Lake Superior, 38, 62, 183, 355, 359, 360, 362-372, 422, 447, 453, 534, 538, 539, 645, 649, 657.  
 Lake Winnipeg, 641, 662.  
 Lallemant, G. A., 858.  
 Lanark County, Ontario, Canada, 189.  
 Lancaster County, Pennsylvania, 321, 323.  
 Lancaster, South Carolina, 556, 570.  
 Lapham, I. A., 454, 466.  
 La Salle County, Illinois, 465.  
 Lawrence, Byrem, 31.  
 Lawrence County, Indiana, 390.  
 Lawrence County, Pennsylvania, 322.  
 Leadville, Colorado, 776.  
 Lebanon County, Pennsylvania, 280.  
 Lee County, Virginia, 609, 616.  
 Leeds County, Ontario, Canada, 189.  
 Lehigh County, Pennsylvania, 294, 306, 325.  
 Lehman, A. E., 295, 298.  
 Lealey, Joseph, Jr., 591, 598.  
 Lealey, J. P., 52, 285, 286, 288, 289, 292, 293, 296, 303-307, 313, 322-324, 336-341, 345-361, 379, 880, 883, 884, 886, 907.

- Leuvu, Chile, 867.  
 Lewis, H. C., 887.  
 Lewistown, Pennsylvania, 272.  
 Licking County, Ohio, 432.  
 Lick Run, Virginia, 587.  
 Lieber O. M., 88, 89, 551, 554-557, 565-571, 573, 574, 576-579.  
 Lincoln County, Kentucky, 911.  
 Lincoln County, Missouri, 715, 716.  
 Lincoln County, Wisconsin, 508, 531.  
 Lincoln (Mount), Colorado, 711.  
 Linney, W. M., 909-913.  
 Little Juniata River, Pennsylvania, 296, 350, 351.  
 Little Pine Creek, Pennsylvania, 331.  
 Little Quinneec Falls, Wisconsin, 520.  
 Little Rocky Mountains, Montana, 634.  
 Little York, California, 686.  
 Llano County, Texas, 792.  
 Llano Estacado, New Mexico, 783.  
 Locke, John, 354, 355.  
 Loew, O., 739, 796.  
 Logan County, Ohio, 425.  
 Logan, Sir W. E., 43, 44, 59, 133, 162, 164, 167, 168, 173, 173, 179-181, 183-185.  
 Long Island, New York, 240.  
 Long, S. H., 29.  
 Lorraine, New York, 237, 239.  
 Los Angeles, California, 677.  
 Louisiana, 24, 785, 786.  
 Lower Black River Falls, Wisconsin, 511.  
 Lower Brulé River, Wisconsin, 525.  
 Lucas County, Ohio, 385.  
 Luzerne County, Pennsylvania, 284.  
 Lycoming County, Pennsylvania, 331, 342.  
 Lyell, Sir Charles, 34, 35, 45, 242-244.  
 Lyman, B. S., 583.  
 Macfarlane, James, 68, 79.  
 Macfarlane, T., 649.  
 Mackie, S. J. 53.  
 MacLeod's Lake, British Columbia, 661.  
 MacLure, William, 25-27, 54.  
 Madawaska River, Canada, 166.  
 Madison County, Missouri, 732.  
 Madison River, Montana, 629, 630.  
 Maganatawan River, Canada, 168.  
 Magdalen Islands, Acadia, 112.  
 Magdalen River, Canada, 170.  
 Mahanoy Basin, Pennsylvania, 347, 348.  
 Maine, 220, 231.  
 Maine, Northern, 218, 219.  
 Manhattan Island, New York, 241.  
 Manitowoc County, Wisconsin, 488.  
 Marathon County, Wisconsin, 477.  
 Marathon, Wisconsin, 890.  
 Marcou, Jules, 7, 8, 10-23, 40, 46-50, 55, 60, 66, 182, 226, 624, 625, 682, 783, 794.  
 Marion County, Alabama, 603.  
 Marion County, Kentucky, 913.  
 Marion County, Missouri, 698.  
 Marion County, Ohio, 402.  
 Marion, Virginia, 583.  
 Mariposa, California, 684, 685.  
 Marquette County, Michigan, 381.  
 Marquette County, Wisconsin, 491.  
 Marquette, Michigan, 387-446.  
 Martha's Vineyard, Massachusetts, 198.  
 Martin de Moussy, V., 837, 854.  
 Marvinne, A. R., 712-714, 746, 747, 749, 793-795, 798.  
 Maryland, 283, 882.  
 Massachusetts, 193, 195, 198, 200, 201, 204, 206, 211, 224, 227.  
 Massachusetts counties:  
     Berkshire, 197.  
     Hampshire, 199.  
 Matamoros, Mexico, 36.  
 Mather, W. W., 239, 240.  
 Matthew, G. F., 126, 128, 129, 159.  
 Matute, J. S., 812.  
 Maury County, Tennessee, 545.  
 Mauvaises Terres of Nebraska, 617, 618.  
 Maycock, J. D., 816.  
 McKean County, Pennsylvania, 330-336.  
 Mecatina, Canada, 176.  
 Medina County, Ohio, 434.  
 Meek, F. B., 695, 700, 701.  
 Menominee District, Michigan, 436.  
 Menominee River, 386, 457, 521.  
 Menominee region, Wisconsin, 526, 527, 532.  
 Mercer County, Kentucky, 909.  
 Mercer County, Pennsylvania, 340.  
 Mexico, 804, 805.  
 Mexico, Gulf of, 81.  
 Michigamme River, Wisconsin, 525.  
 Michigan, 364-367, 369-372, 379, 421, 527, 538.  
 Michigan counties:  
     Marquette, 381.  
 Michigan, Lake, 368.  
 Michigan, lower peninsula, 423.  
 Michigan, northern peninsula, 356-358, 382, 386, 387, 399.  
 Middle Creek, Virginia, 588, 589, 901.  
 Middle Park, Colorado, 713, 714.  
 Middle States, 32.  
 Middle Tennessee, 549.  
 Mifflin County, Pennsylvania, 372.  
 Miller County, Missouri, 700.  
 Milwaukee County, Wisconsin, 487.  
 Minas Gerais, Brazil, 846.  
 Minnesota, 37, 451, 452, 462-464, 469, 171, 472, 478-483, 501-503, 528, 537.  
 Minnesota counties:  
     Pipestone, 513.  
     Ramsey, 512.  
     Rice, 509.  
     Rock, 513.  
 Minnesota River, 517.  
 Mississague River, Canada, 173.  
 Mississagui River, Canada, 184.  
 Mississippi, 551, 559, 560, 575.  
 Mississippi bottom, 560.  
 Mississippi counties:  
     Pontotoc, 563.  
     Tippah, 564.  
     Tishamingo, 561.  
 Mississippi embayment, 787, 788.  
 Mississippi River, 29, 52, 57, 517, 560, 781.  
 Missouri, 37, 702, 703, 708, 709, 725, 731, 873.  
 Missouri counties:  
     Barton, 728.  
     Cape Girardeau, 721.  
     Cedar, 727.  
     Clark, 724.

## Missouri counties—continued.

Cooper, 699.  
 Franklin, 696.  
 Howard, 730.  
 Jasper, 726.  
 Jefferson, 723.  
 Lincoln, 715, 716.  
 Madison, 732.  
 Marion, 693.  
 Miller, 700.  
 Moniteau, 695.  
 Morgan, 701.  
 Newton, 726.  
 Ozark, 718.  
 Pulaski, 720.  
 Saint Genevieve, 722.  
 Saint Louis, 697.  
 Vernon, 729.  
 Wright, 719.  
 Missouri River, 624, 627, 633.  
 Mitchell (Dr.), 540, 544.  
 Moniteau County, Missouri, 695.  
 Monroe County, Wisconsin, 493.  
 Montana, 629, 633, 875.  
 Monte Alegre, Brazil, 848.  
 Monte Diablo, California, 680, 682.  
 Monte Eréré, Brazil, 848.  
 Monterey, California, 36.  
 Monterey Bay, 675.  
 Montgomery County, Pennsylvania, 279.  
 Montreal, Canada, 162.  
 Montreal River, Michigan, 398.  
 Montreal River, Wisconsin, 496, 497, 516.  
 Montserrat, E. de, 804, 807, 834.  
 Morgan County, Missouri, 701.  
 Morrison's Cove, Pennsylvania, 350, 351.  
 Morrow County, Ohio, 411.  
 Moinees, Wisconsin, 887.  
 Mount Lincoln, Colorado, 711.  
 Mount Willard, New Hampshire, 232.  
 Mower County, Minnesota, 479.  
 Moxon, Charles, 33.  
 Mudge, B. F., 772.  
 Mulberry River, Alabama, 607.  
 Munroe County, Indiana, 439.  
 Murray, Alex., 101-104, 106-109, 167, 168.  
 Murray's Caverns, subterranean river, Canada, 175.  
 Muskoka River, Canada, 168.  
 Nanaimo, Vancouver's Island, 644, 646, 647, 650, 660.  
 Nash, A., 199.  
 National Park, 917-920.  
 Nebraska, 56, 617-620, 623, 625, 626, 628, 875.  
 Negaunee, Michigan, 446.  
 Nelson County, Kentucky, 912.  
 Nelson River, Hudson's Bay territory, 662.  
 Nepisiquit River, New Brunswick, 127.  
 Nevada, 61, 746, 751, 752, 774, 777.  
 Newberry, J. S., 374, 380, 384, 391-394, 405, 426, 435, 784.  
 New Brunswick, 114, 121, 122, 124, 126-129, 135, 136, 151, 157, 159, 160.  
 New Brunswick counties:  
 Albert, 128, 129, 151.  
 Carleton, 136, 152.

## New Brunswick counties—continued.

Kings, 123, 129.  
 Queens, 123, 129.  
 St. John, 123, 129.  
 Victoria, 136.  
 Westmoreland, 151.  
 York, 136.  
 New England, 193-232, 878.  
 Newfoundland, 97-107, 108, 121.  
 New Hampshire, 207, 208, 222, 223, 236, 239, 281.  
 New Jersey, 236, 246-248, 250-254, 256, 259, 262, 267.  
 New Jersey counties:  
 Sussex, 249.  
 New Mexico, 761, 763, 768, 795, 801, 875.  
 New River, Virginia, 896, 899.  
 Newton County, Missouri, 736.  
 Newton, Henry, 637.  
 New York, 162, 226, 230, 234, 235, 239, 246, 245, 259, 262, 264, 267, 297.  
 New York counties:  
 Cattaraugus, 330.  
 Clinton, 238.  
 Dutchess, 260.  
 Jefferson, 237.  
 Orange, 235.  
 Putnam, 260.  
 Richmond, 262.  
 Westchester, 258, 260, 264.  
 New York Island, 241.  
 Niagara, 239, 242-244.  
 Nicholson, H. A., 657.  
 Nick's Creek, Virginia, 583.  
 Nicol, C. S., 644.  
 North America, 24-82, 871-876.  
 Northampton County, Pennsylvania, 624.  
 North Burgess, Canada, 188.  
 North Carolina, 540, 541, 544, 558, 598, 895.  
 North Carolina counties:  
 Alleghany, 572.  
 Ashe, 572.  
 Northern Maine, 218, 219.  
 Northernmost parts of America, 84, 85.  
 Northwest coast of America, 669.  
 Norwood, C. J., 726, 730-732.  
 Norwood, J. G., 37, 38, 452, 456.  
 Nova Scotia, 111, 113-121, 124, 125, 181, 185, 193, 199, 148, 149, 153-155, 157, 168, 169.  
 Nova Scotia counties:  
 Antigonish, 152.  
 Cape Breton, 159.  
 Pictou, 156.  
 Nugent, Nicholas, 815.  
 Nutria, Arizona, 791.  
 Oconto County, Wisconsin, 496, 527.  
 Oconto River, Wisconsin, 457.  
 Ogishke Muncie Lake, Minnesota, 538.  
 Ohio, 297, 361, 374-377, 380, 383, 384, 388, 391, 395, 400, 432, 433, 435, 440, 608.  
 Ohio coal basin, 608.  
 Ohio counties:  
 Adams, 354.  
 Ashland, 432.  
 Ashtabula, 398.  
 Butler, 427.  
 Champaign, 425.  
 Clark, 393.

## Ohio counties—continued.

- Coahocton, 432.  
 Crawford, 419.  
 Cuyahoga, 392.  
 Defiance, 406.  
 Delaware, 412.  
 Erie, 405.  
 Franklin, 429.  
 Genaga, 396.  
 Greene, 407.  
 Hancock, 417.  
 Harding, 416.  
 Henry, 429.  
 Highland, 406.  
 Holmes, 432.  
 Huron, 431.  
 Knox, 432.  
 Lake, 396.  
 Licking, 432.  
 Logan, 425.  
 Lucas, 395.  
 Marion, 402.  
 Medina, 434.  
 Morrow, 411.  
 Ottawa, 409.  
 Paulding, 415.  
 Pike, 406.  
 Portage, 426.  
 Preble, 428.  
 Putnam, 419.  
 Richland, 432.  
 Ross, 406.  
 Sandusky, 404.  
 Seneca, 403.  
 Summit, 394.  
 Trumbull, 396.  
 Union, 414.  
 Van Wert, 413.  
 Warren, 430.  
 Wayne, 432.  
 Wood, 418.  
 Wyandot, 401.  
 Ohio River, 517.  
 Ohio Valley, 30, 353.  
 Olmsted County, Minnesota, 490.  
 Omaha City, Nebraska, 624.  
 Ontario, 187, 189.  
 Ontonagon River, 359, 378.  
 Orange County, New York, 225.  
 Orbigay, Alcide d', 835, 851, 852, 861.  
 Orbisonia, Pennsylvania, 318.  
 Oriskany, New York, 239.  
 Orton, Edward, 295, 406, 407, 427-430, 435, 440.  
 Ottawa, Canada, 175.  
 Ottawa County, Canada, 172, 179, 190.  
 Ottawa County, Ohio, 409.  
 Ottawa River, 167, 168.  
 Ottonable River, Canada, 166.  
 Outagamie County, Wisconsin, 486, 488.  
 Owen, D. D., 30, 37, 38, 448-451.  
 Owen, Richard, 453.  
 Oxford, New Jersey, 248.  
 Oxford Lake, Canada, 665.  
 Ozark County, Missouri, 718.  
 Osaukee County, Wisconsin, 487, 488.  
 Pachuca, Mexico, 814.  
 Pacific, 89, 696, 781.  
 Pacific Railroad (S. W. Branch), Missouri, 798.  
 Paint River, Wisconsin, 525.  
 Palisade Trap Range, New Jersey, 289.  
 Pamplona, Colombia, 839.  
 Panama, 841, 842.  
 Parker, Pennsylvania, 339.  
 Pasco, Peru, 859.  
 Patagonia, 852.  
 Paulding County, Ohio, 415.  
 Pavie, P., 877.  
 Peace River, British Columbia, 661.  
 Peake, A. C., 629, 636-746, 744, 745, 752, 754, 821, 822.  
 Peck, J., 541.  
 Peekskill, New York, 269.  
 Peninsula of Avalon, Newfoundland, 199.  
 Pennsylvania, 289-292, 294-352, 679-681, 682-698.  
 Pennsylvania counties:  
   Adams, 295, 296, 693.  
   Allegheny, 304, 312.  
   Armstrong, 339, 344.  
   Beaver, 305.  
   Bedford, 349-351.  
   Blair, 293, 349-351.  
   Bradford, 316.  
   Butler, 303, 337-339.  
   Centre, 296.  
   Chester, 279, 685.  
   Clarion, 334.  
   Clinton, 323.  
   Crawford, 346.  
   Cumberland, 696.  
   Erie, 346.  
   Fayette, 314-328.  
   Franklin, 698.  
   Fulton, 320.  
   Greene, 329.  
   Huntingdon, 296, 316-320, 349-351.  
   Indiana, 324.  
   Jefferson, 345.  
   Lackawanna, 352.  
   Lancaster, 321-323.  
   Lawrence, 322.  
   Lebanon, 290.  
   Lehigh, 294, 306, 325.  
   Luzerne, 284.  
   Lycoming, 331, 342.  
   McKean, 330, 336.  
   Mercer, 340.  
   Mifflin, 272.  
   Montgomery, 279.  
   Northampton, 684.  
   Potter, 306.  
   Schuylkill, 273.  
   Somerset, 296-298, 313.  
   Sullivan, 343.  
   Susquehanna, 352.  
   Tioga, 290, 311.  
   Venango, 332.  
   Washington, 327.  
   Wayne, 352.  
   Westmoreland, 309, 315-326.  
   Wyoming, 307.  
   York, 295, 296, 335, 341.  
 Penobscot Bay, Maine, 290.  
 Penokee Gap, Wisconsin, 493.

- Penokie Range, Wisconsin, 458, 476, 514.  
 Pepin County, Wisconsin, 532.  
 Percé, Gaspé, 178.  
 Percival, J. G., 205.  
 Peru, 865.  
 Peeshattego River, Wisconsin, 457.  
 Peterborough County, Ontario, Canada, 187.  
 Petewahweh River, Canada, 168.  
 Pettes, W. H., 681, 686.  
 Philadelphia, 271.  
 Phillipsburg, Canada, 185, 226.  
 Phillips, J. V., 702.  
 Philney, A. J., 444.  
 Pickens, S. C., 574.  
 Pictou County, Nova Scotia, 156.  
 Pictou, Nova Scotia, 133, 138, 140, 144, 146.  
 Piedmont coal-field, Virginia, 895.  
 Pierce County, Wisconsin, 532.  
 Pigeon Point, Lake Superior, 453.  
 Pike County, Ohio, 406.  
 Pilot Knob, Missouri, 707.  
 Pimas Village, Arizona, 780.  
 Pine River, Wisconsin, 522, 527, 886.  
 Pine Township, Canada, 331.  
 Pipestone County, Minnesota, 513.  
 Pissis, A., 868-870.  
 Placer County, California, 693.  
 Placerville, California, 604.  
 Plank Cabin Valley, Virginia, 319.  
 Platt, Franklin, Jr., 287, 296, 313, 350, 351.  
 Platt, W. G., 324, 344, 345.  
 Plumas County, California, 691.  
 Plymouth, Vermont, 212.  
 Point Lewis, Canada, 180-182.  
 Point Pinos, California, 675.  
 Polk County, Wisconsin, 500.  
 Pontotoc County, Mississippi, 563.  
 Poplar River, Wisconsin, 522, 538.  
 Potsdam, New York, 162, 230.  
 Portage, New York, 239.  
 Portage County, Ohio, 426.  
 Portage County, Wisconsin, 477.  
 Portage Lake, Michigan, 368, 396.  
 Port à Port Bay, Newfoundland, 107.  
 Portland, Maine, 202.  
 Potato River, Wisconsin, 515.  
 Potter County, Pennsylvania, 306.  
 Potter, W. B., 715.  
 Potts Gap, Pennsylvania, 320.  
 Poverty Hill, California, 692.  
 Powell, J. W., 717.  
 Preble County, Ohio, 428.  
 Prime, F., Jr., 308, 326, 884.  
 Prince Edward Island, 114, 124, 135, 143, 157.  
 Proctor, J. R., 914, 915.  
 Puerto Rico, 824.  
 Puerto de Tome, Chili, 867.  
 Pulaaki County, Missouri, 720.  
 Pumpelly, R., 396, 397, 399, 707.  
 Punta de Los Reyes, California, 673.  
 Putnam County, Indiana, 438.  
 Putnam County, New York, 260.  
 Putnam County, Ohio, 419.  
 Pyramid Mount, New Mexico, 788.  
 Quaker Hill, California, 686.  
 Quebec, 163, 186, 231.  
 Queen Charlotte Islands, 663, 664, 667.  
 Queens County, New Brunswick, 123, 129.  
 Queretaro, Mexico, 811.  
 Quenel Mouth, British Columbia, 661.  
 Quinlacocha Lake, Peru, 859.  
 Quinnesec (Big Falls), Wisconsin, 519.  
 Quinnesec (Little Falls), Wisconsin, 520.  
 Racine County, Wisconsin, 487.  
 Rainy Lake, Manitoba, 639.  
 Ramsey County, Minnesota, 512.  
 Rance, C. E., de, 94.  
 Ratzel, Friedr., 78.  
 Ravard (Bravard), 853.  
 Rawdon, Canada, 164.  
 Read, M. C., 398, 431, 432, 435.  
 Red Dog, California, 686.  
 Red River, Texas, 782.  
 Rémond (A. A. Rémond de Corbiveau), 680.  
 Renfrew County, Ontario, Canada, 189.  
 Republic Mountain, Michigan, 381.  
 Rhode, J. G., 90, 91, 93.  
 Rhode Island, 203, 209, 213.  
 Rib River, Wisconsin, 897.  
 Rice County, Minnesota, 509.  
 Richardson, James, 169-171, 174, 186, 650, 651, 660, 664.  
 Richardson, Sir John, 83.  
 Richland County, Ohio, 432.  
 Richland County, Wisconsin, 493, 498.  
 Richmond coal-field, Virginia, 895.  
 Richmond County, New York, 262.  
 Rio Colorado, Arizona, 784.  
 Rio del Rey, Panama, 842.  
 Rio Escribanos, Panama, 842.  
 Rio Grande, Texas, 780, 782.  
 Rio Palenque, Panama, 842.  
 Rio Valencia, Panama, 842.  
 Rivero, M. de, 859.  
 River Tunnel, California, 684, 685.  
 Rivot, L. E., 372, 373.  
 Robb, C., 136, 148, 149, 154.  
 Robb, J., 122.  
 Rock County, Minnesota, 513.  
 Rock County, Wisconsin, 487, 490.  
 Rockhill Gap, Pennsylvania, 318.  
 Rockport, Maine, 221.  
 Rock River, Wisconsin, 449.  
 Rocky Mountains, 635, 734.  
 Rocky Mountain House, Assinibonia, 652.  
 Roemer, F., 779.  
 Roessler, A. R., 789, 790, 792.  
 Rogers, H. D., 51, 236, 278-282.  
 Rogers, W. B., 592, 611, 612.  
 Rhode, J. G., 90, 91, 93.  
 Rominger, C., 399, 423, 446.  
 Ross County, Ohio, 406.  
 Round Rock, West Indies, 823.  
 Routledge, W., 150.  
 Ruby Hill, Nevada, 777.  
 Rupert's Land, 642, 643.  
 Russell County, Virginia, 585-590, 901.  
 Russell's Creek, Virginia, 586.  
 Rutherford, John, 139, 140.  
 Rutland County, Vermont, 215.  
 Saba Island, West Indies, 825.  
 Saguenay River, Canada, 161.



- Saint Anne Harbor, Cape Breton Island, 153.  
 Saint Antony, Fall of, Minnesota, 508.  
 Saint Bartholomew, West Indies, 830.  
 Saint Croix, West Indies, 829.  
 Saint Croix County, Wisconsin, 500, 532.  
 Saint Genevieve County, Missouri, 722.  
 Saint George, Maine, 220.  
 Saint George's Bay, Newfoundland, 104, 105, 107.  
 Saint John County, New Brunswick, 128, 129, 150.  
 Saint John, New Brunswick, 126, 129, 150.  
 Saint John, Orestes, 921, 923.  
 Saint Joseph Island, Canada, 184.  
 Saint Lawrence River, 137, 186.  
 Saint Louis County, Minnesota, 463.  
 Saint Louis County, Missouri, 607.  
 Saint Martin, West Indies, 826.  
 Saint Mary River, Canada, 173.  
 Saint Mary's Bay, Newfoundland, 100.  
 Safford, J. M., 549, 558, 560, 564.  
 Salisbury, Pennsylvania, 313.  
 Salterain y Legarra, P., 833.  
 Salt Island, West Indies, 823.  
 Salvador, 824.  
 Sanders, R. H., 888.  
 San Diego, California, 674, 676.  
 Sand Portage Rapids, Wisconsin, 530.  
 Sandusky County, Ohio, 404.  
 San Francisco, 671.  
 San Francisco Bay, 672, 677.  
 San Franciscoquito Pass, California, 679.  
 San Miguel River, Colorado, 754.  
 Santa Fé, New Mexico, 36, 783, 801.  
 Santa Fé (Argentina), 852.  
 Santo Domingo, West Indies, 831.  
 Saskatchewan River, Assinibonia, 662.  
 Sauk County, Wisconsin, 490, 491, 498.  
 Savage, M. E., 421.  
 Savanna region, Cuba, 818.  
 Sawkins, J. G., 819, 821.  
 Saylor, N., 377, 378, 561, 562.  
 Scaler's diggins, California, 692.  
 Schellenberg, F. Z., 309.  
 Schickendants, F., 867.  
 Schmidt, A., 725, 726.  
 Schoharie, New York, 230.  
 Schuylkill County, Pennsylvania, 273.  
 Scotch Valley, Pennsylvania, 350, 351.  
 Scott County, Virginia, 609-616.  
 Scott's mine, Virginia, 901.  
 Scudder, S. H., 778, 924.  
 Selwyn, A. R. C., 652, 661.  
 Seneca County, Ohio, 408.  
 Shaler, N. S., 504, 505, 509, 600, 613.  
 Shawano County, Wisconsin, 486.  
 Shawashong River, Canada, 166.  
 Sheaffer, A. W., 330, 348.  
 Sheboygan County, Wisconsin, 486.  
 Shelby County, Indiana, 442.  
 Shenandoah Basin, Pennsylvania, 347, 348.  
 Shenango River, Pennsylvania, 338.  
 Sherwood, A., 306, 307, 310, 311, 342, 343.  
 Shumard, B. F., 606, 607, 718-724.  
 Sierra de San Luis (Argentina), 858.  
 Sideling Hill, Pennsylvania, 317.  
 Sideling Hill Creek, Pennsylvania, 520.  
 Sierra County, California, 601.  
 Simonin, Louis, 9, 61, 62, 806.  
 Sinking Valley, Pennsylvania, 350, 351.  
 Sioux City, Iowa, 624.  
 Sipeey River, Alabama, 607.  
 Skidegate Inlet, British Columbia, 664.  
 State Creek, California, 691.  
 Slippery Rock Creek, Pennsylvania, 338.  
 Smartsville, California, 667.  
 Smith, E. A., 597, 602-607, 615.  
 Smith, S., 290.  
 Smith's Valley, Pennsylvania, 317.  
 Smock, J. C., 247-251, 253, 256, 263.  
 Smoky River, British Columbia, 661.  
 Smyth County, Virginia, 563.  
 Snake River, Idaho, 630.  
 Somerset County, Pennsylvania, 286-288, 312.  
 Sooke Inlet, British Columbia, 660.  
 South America, 835-837, 845, 847, 850.  
 South Carolina, 546, 566, 577.  
 South Carolina counties:  
     Abbeville, 578, 579.  
     Anderson, 578.  
     Chester, 555, 560.  
     Chesterfield, 567, 571.  
     Greenville, 574.  
     Lancaster, 554, 570.  
     Pickens, 574.  
     Spartanburg, 554, 567.  
     Union, 565, 566.  
     York, 554, 566, 568.  
 South Hudson's Bay, 628.  
 Southwestern Ohio, 386.  
 Spanish Peak, California, 688.  
 Spanish Peaks, Colorado, 742.  
 Spartanburg, South Carolina, 566, 567.  
 Spear, J. C., 810.  
 Spencer, J. W., 424.  
 Spencer County, Kentucky, 912.  
 Sperry, L. B., 509.  
 Staley's Creek, Virginia, 563.  
 Staten Island, 240.  
 Steel County, Minnesota, 462.  
 Steenstrup, K. J. V., 90-93.  
 Sheep Hollow Creek, California, 698.  
 Steinsner, Alfred, 856.  
 Stevenson, J. J., 312, 314, 315, 326-328, 388, 423, 506, 616, 797, 799-801.  
 Stevens Point, Wisconsin, 893.  
 Stewart Lake, British Columbia, 661.  
 Stony Point, New York, 206.  
 Straight of Georgia, British Columbia, 661.  
 Stranch, 291.  
 Strong, M., 490, 498-500, 529-532.  
 Sturgeon River, Michigan, 518, 527.  
 Sullivan County, Pennsylvania, 343.  
 Summit County, Ohio, 294.  
 Susquehanna County, Pennsylvania, 352.  
 Sussex County, New Jersey, 249.  
 Swallow, G. C., 606, 608, 703, 708.  
 Sweet, E. T., 510, 511, 530, 531.  
 Sydney, Cape Breton Island, 142, 147, 148, 150, 154.  
 Sydney, North, Cape Breton Island, 153.  
 Sydney River, Cape Breton Island, 153.  
 Tabatinga, Brazil, 850.  
 Table Mountains, California, 688.  
 Tamaqua, Pennsylvania, 273.

- Taylor, R. C., 2, 121, 272, 274, 275, 276, 818, 842.  
 Tazewell County, Virginia, 585-590.  
 Tehuantepec, Mexico, 808, 810.  
 Tejon Pass, California, 679.  
 Tennessee, 541, 542, 549, 558, 580, 582, 584.  
 Tennessee counties:  
     Cocke, 543.  
     Davidson, 545.  
     Maury, 545.  
     Williamson, 545.  
 Tequesquite, Zacatecas, 809.  
 Terrebone County, Canada, 179.  
 Texas, 772, 789, 790.  
 Texas counties:  
     Llano, 792.  
 Three Springs, Pennsylvania, 316, 319.  
 Thirty-fifth parallel, 781.  
 Thirty-second parallel, 782.  
 Thompson, Zadock, 878.  
 Thunder Cape, Lake Superior, 649.  
 Tibby Creek, Mississippi, 562.  
 Tioga County, Pennsylvania, 290, 311.  
 Tippah County, Mississippi, 564.  
 Tishamingo County, Mississippi, 561.  
 Tlalpujahua, Mexico, 802.  
 Tobique River, New Brunswick, 127.  
 Toluca, Mexico, 806.  
 Tompkins, Westchester County, New York, 268.  
 Toyabe Mountains, Nevada, 704.  
 Trempealeau County, Wisconsin, 493, 532.  
 Trenton, New Jersey, 261.  
 Trenton Falls, New York, 239.  
 Trinidad Region, Colorado, 743.  
 Trinidad, West Indies, 819, 832.  
 Trois Pistoles River, Canada, 186.  
 Troost, Gerard, 271, 542, 543, 545.  
 Trumbull County, Ohio, 398.  
 Tucumcari Hills, New Mexico, 763.  
 Tuolumne County, California, 688.  
 Tuomey, M., 546, 547, 550, 552.  
 Tuscaloosa, Alabama, 607.  
 Tussey Mountains, Pennsylvania, 350, 351.  
 Twin Falls, Wisconsin, 521.  
 Two Mountains County, Canada, 179.  
 Tyler's Fork, Wisconsin, 474.  
 Tyrone Gap, Pennsylvania, 293.  
 Tyson, P. T., 283-670.  
 Uinta Mountains, Utah, 696, 717, 750.  
 Unaweep Cañon, Colorado, 745.  
 Union County, Ohio, 414.  
 Union, South Carolina, 565, 566.  
 Union Pacific Railroad, 717.  
 United States, 25-28, 33-35, 40-42, 45, 46, 48-51, 54, 55, 59, 60, 63, 65-70, 72-79, 82, 876, 879.  
 Upper Grand Middle Park, Colorado, 714.  
 Upper Missouri, 633.  
 Upper Yellowstone, Montana, 629, 630.  
 Ursina, Pennsylvania, 286-288.  
 Utah, 746, 747, 749, 750, 757, 760, 761, 773, 775, 793, 875, 915, 916.  
 Utica, New York, 239.  
 Valladolid, Mexico, 802.  
 Vancouver Island, 645-648, 650, 651, 660.  
 Vanuxem, L., 239.  
 Van Wert County, Ohio, 413.  
 Venango County, Pennsylvania, 332.  
 Venezuela, 840.  
 Vennor, H. G., 187-190.  
 Veraguas, Costa Rica, 842.  
 Vermont, 185, 212, 214, 216, 217, 226, 228, 231, 878.  
 Vermont counties:  
     Isle La Motte, 215.  
     Rutland, 215.  
 Vernon County, Missouri, 729.  
 Vernon County, Wisconsin, 498.  
 Verplank, New York, 268.  
 Victoria County, New Brunswick, 136.  
 Virginia, 572, 585, 586, 592, 601, 606-612, 614, 616, 902-905, 907.  
 Virginia counties:  
     Carroll, 572.  
     Floyd, 572.  
     Grayson, 572.  
     Lee, 609, 616.  
     Russell, 585-590, 907.  
     Scott, 609, 616.  
     Smyth, 583.  
     Tazewell, 585-590.  
     Wise, 585-590, 606, 616.  
     Washington, 609, 616.  
 Virginia, Nevada, 774.  
 Virgin Islands, West Indies, 838.  
 Vivian, A. P., 80.  
 Walker County, Alabama, 604.  
 Wall, G. P., 819, 820, 845.  
 Walworth County, Wisconsin, 497.  
 Warren County, Ohio, 430.  
 Warren, G. K., 517.  
 Washington County, Kentucky, 913.  
 Washington County, Pennsylvania, 327.  
 Washington County, Virginia, 609, 616.  
 Washington County, Wisconsin, 497, 498.  
 Washoe, Nevada, 706.  
 Waukecha County, Wisconsin, 497.  
 Waupaca County, Wisconsin, 498.  
 Wausau, Wisconsin, 895.  
 Wauabara County, Wisconsin, 491.  
 Wayne County, Ohio, 432.  
 Wayne County, Pennsylvania, 352.  
 Westchester County, New York, 268, 269, 264.  
 Western Canada, 191, 640.  
 West India Islands, North Eastern, 827.  
 Westmoreland County, New Brunswick, 151.  
 Westmoreland County, Pennsylvania, 309, 315, 326.  
 Western States, 31, 32.  
 West Tennessee, 580.  
 West Virginia, 297, 595, 608, 611, 612, 614.  
 White, C. A., 467, 468, 470, 755.  
 White, G., 548.  
 White, I. C., 303-305, 312, 322, 340, 346, 352.  
 White Mountains, New Hampshire, 225.  
 White Pine, Nevada, 705.  
 White River, Utah, 717.  
 Whitney, J. D., 364, 369, 371, 455, 459, 461, 688-691, 693, 694.  
 Whittlesey, Charles, 37, 38, 361, 375, 376, 383, 400, 422, 457, 458, 462-464, 476.  
 Williamson County, Tennessee, 545.  
 Williamson's Pass, California, 679.  
 Winchell, Alexander, 879.  
 Winchell, N. H., 401-404, 408-420, 435, 447, 471, 472, 478, 479, 483, 501-503, 512, 513, 538, 539, 632.

## ADVERTISEMENT.

Geology and Mining Industry of Leadville, with atlas, by S. F. Emmons. In preparation.  
 Geology of the Eureka Mining District, Nevada, with atlas, by Arnold Hague. In preparation.  
 Lake Bonneville, by G. K. Gilbert. In preparation.  
 Dinocerata: A monograph on an extinct order of Ungulates, by Prof. O. C. Marsh. In preparation.  
 Sauri-poda, by Prof. O. C. Marsh. In preparation.  
 Stegosauria, by Prof. O. C. Marsh. In preparation.  
 Of these Monographs, Nos. II, III, IV, V, VI, and VII are now published, viz:  
 II. Tertiary History of the Grand Cañon District, with atlas, by C. E. Dutton, Capt. U. S. A. 1882.  
 4°. 264 pp. 42 pl. and atlas of 26 double sheets folio. Price \$10.12.  
 III. Geology of the Comstock Lode and Washoe District, with atlas, by George F. Becker. 1882. 4°. xv, 422 pp. 7 pl. and atlas of 21 sheets folio. Price \$11.  
 IV. Comstock Mining and Miners, by Eliot Lord. 1883. 4°. xiv, 451 pp. 3 pl. Price \$1.50.  
 V. Copper-bearing Rocks of Lake Superior, by Prof. R. D. Irving. 1883. 4°. xiv, 364 pp. 26 pl. Price \$—.  
 VI. Contributions to the Knowledge of the Older Mesozoic Flora of Virginia, by William M. Fontaine. 1883. 4°. xix, 144 pp. 54 l. 54 pl. Price \$—.  
 VII. Silver-lead Deposits of Eureka, Nevada, by Joseph S. Curtis. 1884. 4°. xii, 206 pp. 15 pl. Price \$—.  
 Nos. VIII and IX are in press and will soon appear. The others, to which numbers are not assigned, are in preparation.

## BULLETINS.

The Bulletins of the Survey will contain such papers relating to the general purpose of its work as do not properly come under the heads of ANNUAL REPORTS or MONOGRAPHS.

Each of these Bulletins will contain but one paper, and be complete in itself. They will, however, be numbered in a continuous series, and will in time be united into volumes of convenient size. To facilitate this each Bulletin will have two paginations, one proper to itself and another which belongs to it as part of the volume.

Of this series of Bulletins Nos. 1, 2, 3, 4, 5, 6, 7, and 8 are already published, viz:

1. On Hypersthene-Andesite and on Triclinic Pyroxene in Aegitic Rocks, by Whitman Cross, with a Geological Sketch of Buffalo Peaks, Colorado, by S. F. Emmons. 1883. 8°. 40 pp. 2 pl. Price 10 cents.
2. Gold and Silver Conversion Tables, giving the Coining Value of Troy Ounces of Fine Metal, &c., by Albert Williams, jr. 1883. 8°. ii, 8 pp. Price 5 cents.
3. On the Fossil Faunas of the Upper Devonian along the Meridian of 76° 30', from Tompkins County, New York, to Bradford County, Pennsylvania, by Henry S. Williams. 1884. 8°. 86 pp. Price 5 cents.
4. On Mesozoic Fossils, by Charles A. White. 1884. 8°. 36 pp. 9 pl. Price 5 cents.
5. A Dictionary of Altitudes in the United States, compiled by Henry Gannett. 1884. 8°. 325 pp. Price 20 cents.
6. Elevations in the Dominion of Canada, by J. W. Spencer. 1884. 8°. 43 pp. Price 5 cents.
7. *Mapoteca Geologica Americana*. A Catalogue of Geological Maps of America (North and South), 1752-1881, by Jules Marcou and John Belknap Marcou. 1884. 8°. 184 pp. Price 10 cents.
8. On Secondary Enlargement of Mineral Fragments in Certain Rocks, by R. D. Irving and C. B. Vanhise. 1884. 8°. 56 pp. Price 10 cents.

## STATISTICAL PAPERS.

A fourth series of publications having special reference to the mineral resources of the United States is contemplated. Of that series the first has been published, viz: *Mineral Resources of the United States*, by Albert Williams, jr. 1883. 8°. xvii, 813 pp. Price 50 cents.

Correspondence relating to the publications of the Survey, and all remittances, which must be by postal note or money order, should be addressed to the

DIRECTOR OF THE UNITED STATES GEOLOGICAL SURVEY,  
 Washington, D. C.

WASHINGTON, D. C., August 30, 1884.

## ADVERTISEMENT.

(Bulletin No. 8.)

The publications of the United States Geological Survey are issued in accordance with the statute approved March 3, 1879, which declares that—

"The publications of the Geological Survey shall consist of the annual report of operations, geological and economic maps illustrating the resources and classifications of the lands, and reports upon general and economic geology and paleontology. The annual report of operations of the Geological Survey shall accompany the annual report of the Secretary of the Interior. All special memoirs and reports of said Survey shall be issued in uniform quarto series if deemed necessary by the Director, but otherwise in ordinary octavos. Three thousand copies of each shall be published for scientific exchanges and for sale at the price of publication; and all literary and cartographic materials received in exchange shall be the property of the United States and form a part of the library of the organization. And the money resulting from the sale of such publications shall be covered into the Treasury of the United States."

On July 7, 1882, the following joint resolution, referring to all Government publications, was passed by Congress:

"That whenever any document or report shall be ordered printed by Congress, there shall be printed, in addition to the number in each case stated, the 'usual number' (1,900) of copies for binding and distribution among those entitled to receive them."

Under these general laws it will be seen that none of the Survey publications are furnished to it for gratuitous distribution. The 3,000 copies of the Annual Report are distributed through the document rooms of Congress. The 1,900 copies of each of the publications are distributed to the officers of the legislative and executive Departments and to stated depositories throughout the United States.

Except, therefore, in those cases where an extra number of any publication is supplied to this office by special resolution of Congress, as has been done in the case of the Second, Third, Fourth, and Fifth Annual Reports, or where a number has been ordered for its use by the Secretary of the Interior, as in the case of Williams's Mineral Resources, the Survey has no copies of any of its publications for gratuitous distribution.

### ANNUAL REPORTS.

Of the Annual Reports there have been already published:

- I. First Annual Report to the Hon. Carl Schurz, by Clarence King. 1880. 8°. 79 pp. 1 map. A preliminary report describing plan of organization and publications.
  - II. Report of the Director of the United States Geological Survey for 1880-'81, by J. W. Powell. 1882. 8°. 1v, 588 pp. 61 pl., 1 map.
  - III. Third Annual Report of the United States Geological Survey, 1881-'82, by J. W. Powell. 1883. 8°. xviii, 564 pp. 67 pl. and maps.
  - IV. Fourth Annual Report of the United States Geological Survey, 1882-'83, by J. W. Powell. 1884. 8°. xii, 473 pp. 85 pl. and maps.
- The Fifth Annual Report is in press.

### MONOGRAPHS.

So far as already determined upon, the list of the Monographs is as follows:

- I. The Precious Metals, by Clarence King. In preparation.
- II. Tertiary History of the Grand Cañon District, with atlas, by Capt. C. E. Dutton. Published.
- III. Geology of the Comstock Lode and Washoe District, with atlas, by George F. Becker. Published.
- IV. Comstock Mining and Miners, by Elliot Lord. Published.
- V. Copper-bearing Rocks of Lake Superior, by Prof. R. D. Irving. Published.
- VI. Older Mesozoic Flora of Virginia, by Prof. William M. Fontaine. Published.
- VII. Silver-lead Deposits of Eureka, Nevada, by Joseph S. Curtis. Published.
- VIII. Paleontology of the Eureka District, Nevada, by Charles D. Walcott. In press.
- IX. Brachiopoda and Lamellibranchiata of the Green Marls and Clays of New Jersey, by R. P. Whitfield.

## ADVERTISEMENT.

- Geology and Mining Industry of Leadville, with atlas, by S. F. Emmons. In preparation.  
 Geology of the Eureka Mining District, Nevada, with atlas, by Arnold Hague. In preparation.  
 Lake Bonneville, by G. K. Gilbert. In preparation.  
 Dinocerata: A monograph on an extinct order of Ungulates, by Prof. O. C. Marsh. In preparation.  
 Sauroptoda, by Prof. O. C. Marsh. In preparation.  
 Stegoosauria, by Prof. O. C. Marsh. In preparation.  
 Of these Monographs, Nos. II, III, IV, V, VI, and VII are now published, viz:
- II. Tertiary History of the Grand Cañon District, with atlas, by C. E. Dutton, Capt. U. S. A. 1882. 4°. 264 pp. 42 pl. and atlas of 26 double sheets folio. Price \$10.12.
  - III. Geology of the Comstock Lode and Washoe District, with atlas, by George F. Becker. 1882. 4°. xv, 423 pp. 7 pl. and atlas of 21 sheets folio. Price \$11.
  - IV. Comstock Mining and Miners, by Eliot Lord. 1883. 4°. xiv, 451 pp. 3 pl. Price \$1.50.
  - V. Copper-bearing Rocks of Lake Superior, by Prof. R. D. Irving. 1883. 4°. xiv, 484 pp. 20 pl. Price \$—.
  - VI. Contributions to the Knowledge of the Older Mesozoic Flora of Virginia, by William M. Fontaine. 1883. 4°. xix, 144 pp. 54 l. 54 pl. Price \$—.
  - VII. Silver-lead Deposits of Eureka, Nevada, by Joseph S. Curtis. 1884. 4°. xii, 200 pp. 15 pl. Price \$—.
- Nos. VIII and IX are in press and will soon appear. The others, to which numbers are not assigned, are in preparation.

## BULLETINS.

The Bulletins of the Survey will contain such papers relating to the general purpose of its work as do not properly come under the heads of ANNUAL REPORTS or MONOGRAPHS.

Each of these Bulletins will contain but one paper, and be complete in itself. They will, however, be numbered in a continuous series, and will in time be united into volumes of convenient size. To facilitate this each Bulletin will have two paginations, one proper to itself and another which belongs to it as part of the volume.

Of this series of Bulletins Nos. 1, 2, 3, 4, 5, 6, 7, and 8 are already published, viz:

1. On Hypersthene-Andesite and on Triclinic Pyroxene in Angitic Rocks, by Whitman Cross, with a Geological Sketch of Buffalo Peaks, Colorado, by S. F. Emmons. 1883. 8°. 40 pp. 2 pl. Price 10 cents.
2. Gold and Silver Conversion Tables, giving the Coining Value of Troy Ounces of Fine Metal, &c., by Albert Williams, Jr. 1883. 8°. ii, 8 pp. Price 5 cents.
3. On the Fossil Faunas of the Upper Devonian along the Meridian of 76° 30', from Tompkins County, New York, to Bradford County, Pennsylvania, by Henry S. Williams. 1884. 8°. 26 pp. Price 5 cents.
4. On Mesozoic Fossils, by Charles A. White. 1884. 8°. 36 pp. 9 pl. Price 5 cents.
5. A Dictionary of Altitudes in the United States, compiled by Henry Gannett. 1884. 8°. 325 pp. Price 20 cents.
6. Elevations in the Dominion of Canada, by J. W. Spencer. 1884. 8°. 43 pp. Price 5 cents.
7. *Mapoteca Geologica Americana*. A Catalogue of Geological Maps of America (North and South), 1752-1881, by Jules Marcou and John Belknap Marcou. 1884. 8°. 184 pp. Price 10 cents.
8. On Secondary Enlargement of Mineral Fragments in Certain Rocks, by R. D. Irving and C. R. Vanhise. 1884. 8°. 56 pp. Price 10 cents.

## STATISTICAL PAPERS.

A fourth series of publications having special reference to the mineral resources of the United States is contemplated. Of that series the first has been published, viz: *Mineral Resources of the United States*, by Albert Williams, Jr. 1883. 8°. xvii, 813 pp. Price 50 cents.

Correspondence relating to the publications of the Survey, and all remittances, which must be by postal note or money order, should be addressed to the

DIRECTOR OF THE UNITED STATES GEOLOGICAL SURVEY,

Washington, D. C.

WASHINGTON, D. C., August 30, 1884.





HURONIAN QUARTZITE OF NEEBISH ISLAND, EAST SIDE ST. MARY'S RIVER. FROM THE WEST.  
(The dip is towards the observer.)

UNITED STATES GEOLOGICAL SUR

J. W. POWELL DIRECTOR

---

ON

SECONDARY ENLARGE

OF

MINERAL FRAGMEN

IN

CERTAIN ROCKS

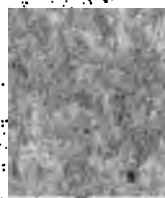
BY

R. D. TILLEY AND R. VAN



WASHINGTON  
GOVERNMENT PRINTING OFFICE  
1884





UNITED STATES GEOLOGICAL SURVEY

J. W. POWELL DIRECTOR

---

ON

# SECONDARY ENLARGEMENTS

OF

## MINERAL FRAGMENTS

IN

## CERTAIN ROCKS

BY

R. D. IRVING and C. R. VAN HISE



WASHINGTON  
GOVERNMENT PRINTING OFFICE  
1884



**LETTER OF TRANSMITTAL**

---

UNITED STATES GEOLOGICAL SURVEY,  
*Madison, Wis., April 1, 1884.*

SIR: I have the honor to transmit herewith a paper on Secondary Enlargements of Mineral Fragments in Certain Rocks, prepared by myself and Assistant Geologist C. R. Van Hise.

The plates were all drawn from nature with the camera lucida, by Assistant Geologist W. N. Merriam.

I am, sir, very respectfully yours,

ROLAND D. IRVING,  
*Geologist in Charge of the Survey of  
Pre-Cambrian Rocks of the Northwestern States.*

Hon. J. W. POWELL,  
*Director United States Geological Survey,  
Washington, D. C.*

5



# CONTENTS.

|                                                                                                                 | Page. |
|-----------------------------------------------------------------------------------------------------------------|-------|
| Letter of transmittal.....                                                                                      | 5     |
| Contents.....                                                                                                   | 7     |
| List of illustrations .....                                                                                     | 9     |
| PART I.—Enlargements of quartz fragments and genesis of quartzites, by<br>R. D. Irving and C. R. Van Hise ..... | 11    |
| General considerations .....                                                                                    | 11    |
| List of localities of rocks examined, with brief descriptive notes.....                                         | 23    |
| For Huronian rocks.....                                                                                         | 23    |
| In the typical Huronian of Lake Huron.....                                                                      | 23    |
| In the iron-bearing series of Marquette, Mich .....                                                             | 27    |
| In the iron-bearing series of the Penokee region of Wisconsin.....                                              | 30    |
| In the slates of the Saint Louis River, Minnesota.....                                                          | 32    |
| In the quartzite formation of the Baraboo region of Wisconsin.....                                              | 33    |
| In the quartzite formation of Southern Minnesota .....                                                          | 34    |
| In the Animikie series of Northern Minnesota, and the Thunder Bay<br>region of Lake Superior.....               | 35    |
| In the folded schists of the national boundary line, north of Lake<br>Superior .....                            | 37    |
| For Keweenawan sandstones .....                                                                                 | 38    |
| For Cambrian rocks.....                                                                                         | 39    |
| In the Grand Cañon group of the Colorado River .....                                                            | 39    |
| In the Potsdam sandstone of the Mississippi Valley .....                                                        | 39    |
| In the Eastern sandstone of Lake Superior.....                                                                  | 40    |
| In the Western sandstone of Lake Superior .....                                                                 | 41    |
| For Silurian rocks .....                                                                                        | 41    |
| In the Saint Peter's sandstone of Wisconsin.....                                                                | 41    |
| In the Eureka quartzite of Nevada .....                                                                         | 42    |
| For Devonian rocks.....                                                                                         | 42    |
| For Carboniferous rocks.....                                                                                    | 43    |
| For Triassic rocks .....                                                                                        | 43    |
| For Cretaceous rocks.....                                                                                       | 43    |
| PART II.—Enlargements of feldspar fragments in certain Keweenawan sand-<br>stones, by C. R. Van Hise .....      | 44    |
| PART III.—Summary of general conclusions, by R. D. Irving .....                                                 | 48    |



## ILLUSTRATIONS.

To face p

**PLATE I.**—Huronian quartzite of East Neebish Rapids, Saint Mary's River..

**PLATE II.** Crystal-faced enlargements of quartz fragments.....

**FIG. 1.** Single grain of the sandstone intercalated in Huronian quartzite of East Neebish Island. Enlarged 67 diameters. No. 17 of the list, p. 26. The outlines of the crystal faces were drawn in from a dry mounting, after which the grain was covered with balsam and the nucleal fragment drawn.

**FIG. 2.** Another grain from the same sandstone, drawn from a balsam mounting. Enlarged 67 diameters.

**FIG. 3.** Single grain of the Huronian sandstone of Spurr Mountain, Mich. No. 30 of the list, p. 30. Drawn from a balsam mounting. Enlarged 100 diameters.

**FIGS. 4, 5, 6.** Single grains from the Potsdam sandstone of New Lisbon, Wis. No. 87 of the list, p. 40. Balsam mounting. Enlarged 95 diameters.

**FIGS. 7, 9.** Single grains of the Potsdam sandstone of the quarry on the Torch Lake Railroad, Keweenaw Point, Michigan. No. 90 of the list, p. 40. Enlarged 67 diameters.

**FIG. 8.** Portion of a thin section of the same sandstone, showing how nucleal fragments and enlargements polarize together. Enlarged 67 diameters. The black spaces are holes in the section.

**PLATE III.**—Thin sections of quartzites .....

**FIG. 1.** Quartzite crust of Saint Peter's sandstone, Arlington Prairie, Columbia County, Wisconsin. No. 95 of the list, p. 42. The enlargements have often taken crystal faces. Ordinary light. Enlarged 35 diameters.

**FIG. 2.** Arenaceous quartzite, Animikie series, Portage Bay Island, Minnesota, coast of Lake Superior. No. 61 of the list, p. 36. Polarized light. Enlarged 45 diameters.

**PLATE IV.**—**FIGS. 1 and 2.** Thin sections of red quartzite, Animikie group, Prairie River Falls, Minnesota. No. 58 of the list, p. 35. The same section in ordinary and polarized light. Enlarged 39 diameters .....

**PLATE V.**—Thin sections of sandstone and quartzite.....

**FIG. 1.** Indurated Saint Peter's sandstone, Gibraltar Bluff, Columbia County, Wisconsin. No. 96 of the list, p. 42. Polarized light. Enlarged 35 diameters.

**FIG. 2.** Huronian quartzite of Neebish Island, Saint Mary's River. No. 12 of the list, p. 25. Polarized light. Enlarged 35 diameters.



- To face page  
29
- PLATE VI.—Thin sections of quartzite, &c.....
- FIG. 1 (upper half). Huronian quartzite from Gannister quarry, south side of Carp River, near Marquette, Mich. No. 22 of the list, p. 28. Polarized light. Enlarged 31 diameters.
- FIG. 1 (lower half). Huronian quartz-schist from near Marquette, Mich. No. 27 of the list, p. 29. Polarized light. Enlarged 36 diameters. Designed to show schistose structure and induration by independently oriented quartz.
- FIG. 2 (upper half). Red quartzite of Prairie River Falls, Minnesota. No. 58 of the list, p. 35. Enlarged 31 diameters. Polarized light. Drawn to show the enlargement of a complex grain.
- FIG. 2 (lower half). Cherty Potsdam sandstone, Westfield, Sauk County, Wisconsin. Polarized light. Enlarged 35 diameters. A cherty matrix holds grains of quartz which have received enlargements.

## I.

### ENLARGEMENTS OF QUARTZ FRAGMENTS AND GENESIS OF QUARTZITES.

BY R. D. IRVING AND C. R. VAN HISE.

#### GENERAL CONSIDERATIONS.

In his address before the Geological Society of London, delivered February 20, 1880,<sup>1</sup> Sorby describes sands whose grains are bounded externally by crystalline faces, but have in the interior the ordinary rolled grains, the crystalline faces having been produced by a secondary deposition of quartz upon the irregular surfaces of the original grains. He shows also that the quartz coatings of these grains are in perfect "optical and crystalline continuity" with the interior fragments, each original fragment having thus been changed to a definite crystal.

He states further that he had examined crystalline sands from the sandstones of various ages "from the Oolites down to the Old Red," and that they are commonly little coherent, but that in some specimens "a number of grains may often be seen cohering more strongly than the rest, and these show clearly that the cavities originally existing between the grains have been more or less completely filled with quartz. Moreover, on carefully examining the less coherent grains by surface illumination, we can see not only the planes and angles due to unimpeded crystallization, but also more or less deep impressions due to the interference of contiguous grains, thus proving conclusively that the deposition of crystalline quartz took place after the nuclei were deposited as a bed of normal sand. The very imperfect consolidation sometimes met with is, perhaps, not so very surprising when we reflect on the very small coherence of many large quartz crystals which are yet in close juxtaposition. However, it does seem probable that this crystallization of quartz sometimes contributes very materially to the cohesion of the grains in hard and compact quartzites. In such examples as the Gannister of the South Yorkshire coal-field we can see in a thin section that the grains fit alongside one another in a very striking manner, and it is only by extreme care that good proof can be obtained of the actual deposition of quartz between them. However, in the case of a highly consolidated sandstone from Trinidad the proof of the deposition of quartz is as complete as possible;

<sup>1</sup> Proc. Geol. Soc. Lond., 1880, p. 62.

## 12 SECONDARY ENLARGEMENTS OF MINERAL FRAGMENTS. [BULL. 2.]

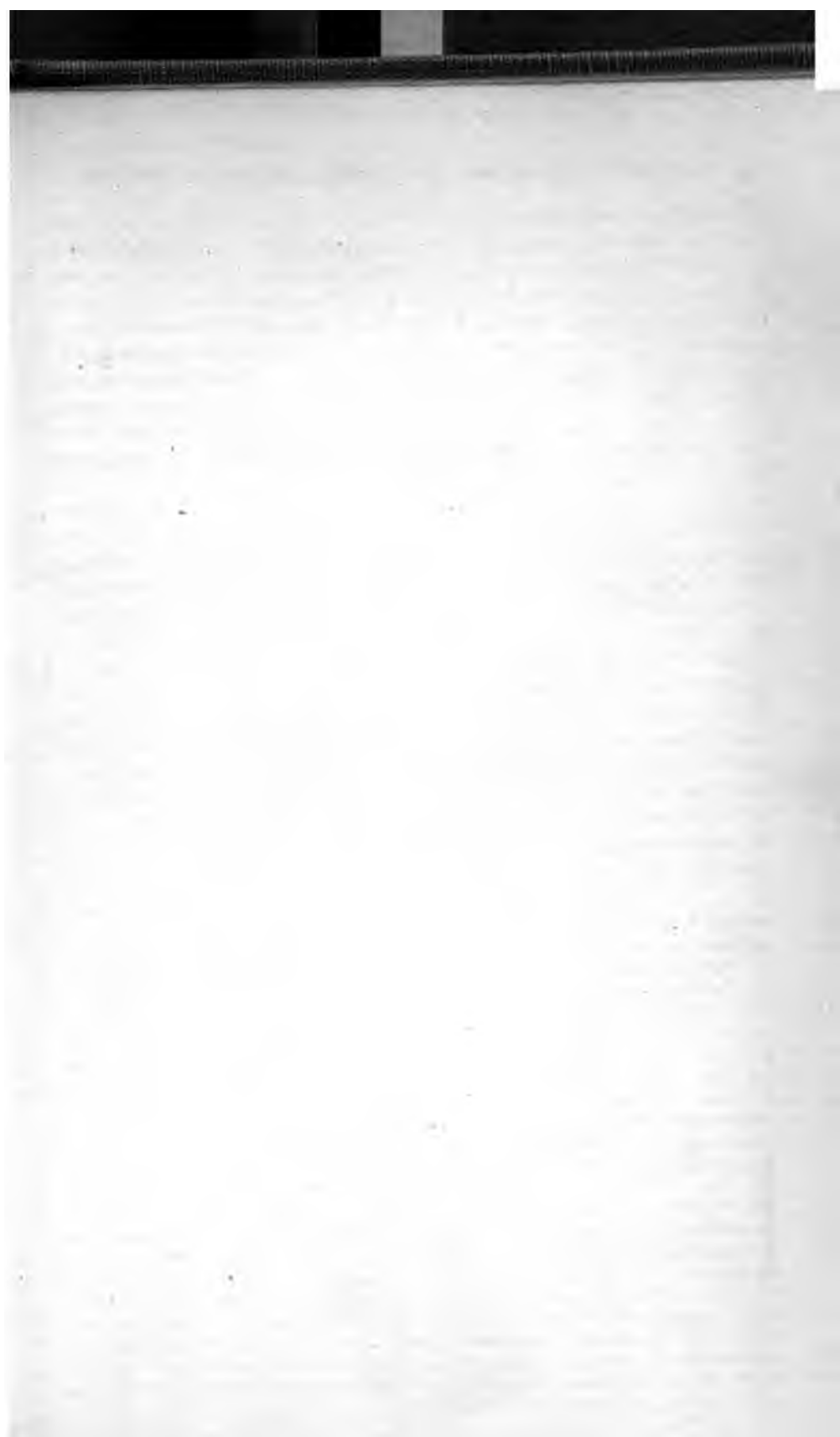
the outline of the original grains of sand is perfectly distinct, and the cavities between them are filled with clear quartz in crystalline continuity with the contiguous grains; so that the whole is a mass of interfering crystals, each having a sand-grain as a nucleus. The rock has thus been converted into a hard quartzite, almost like a true quartz rock, but differs from such quartz rocks as those of the Scotch Highlands in containing no mica crystallized *in situ*. All my specimens of these quartz rocks are really highly quartzose mica-schists; and, so far, I have failed in my endeavors to trace the connection between them and true sandstones, though possibly this could be easily done in some districts which I have not examined."<sup>2</sup>

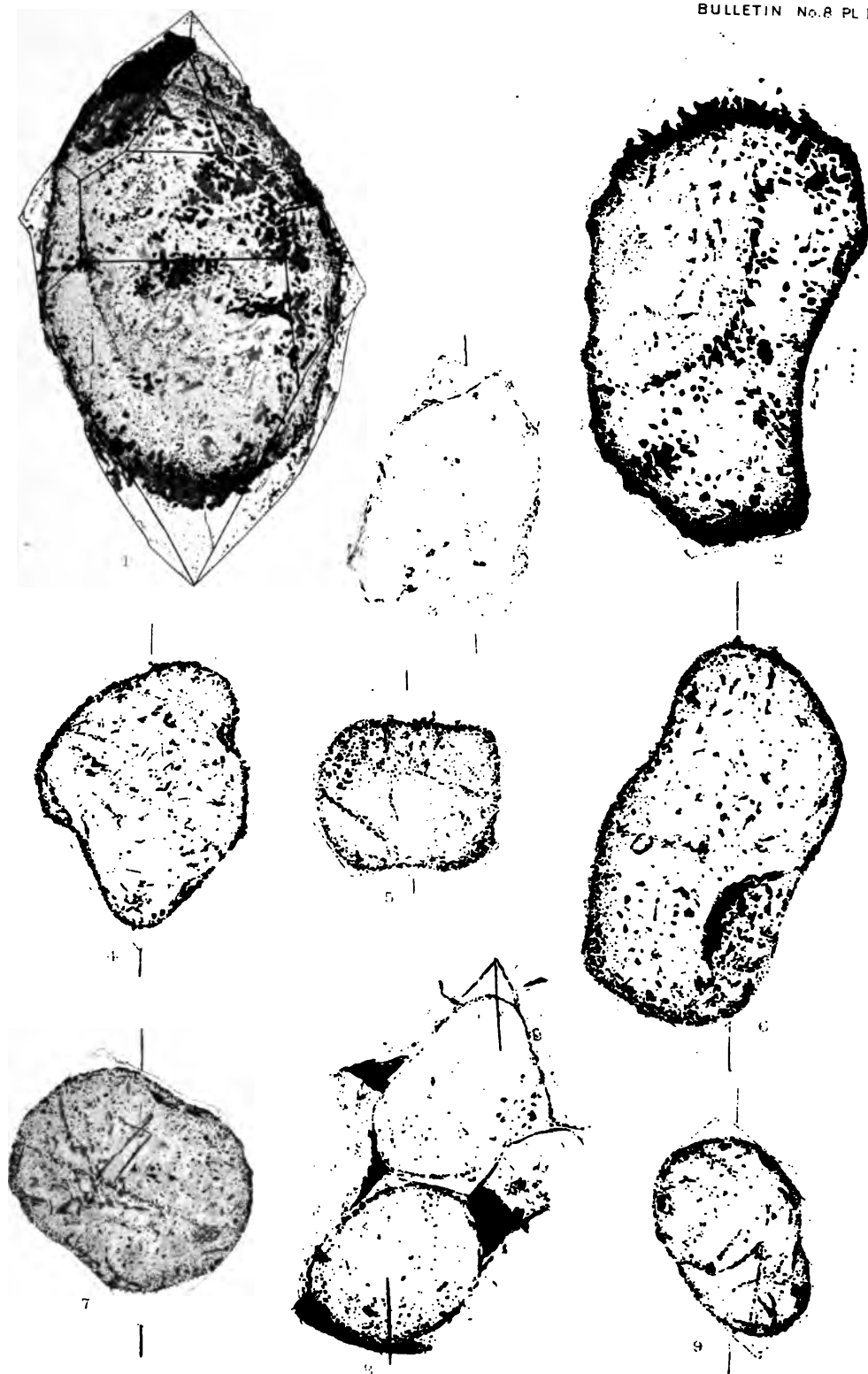
In the American Journal of Science for July, 1881, A. A. Young describes a sandstone from the Potsdam sandstone of New Lisbon, Wis., the rolled grains of which are enveloped in secondary crystal-faceted quartz coatings. In the same journal for June, 1883, the senior author of this paper showed what Sorby regards as probable, viz: that the "cohesion of the grains in hard and compact quartzites" is due to this deposition of interstitial quartz, to be certainly true in the cases of certain quartzites and mica-bearing quartz-schists of Archæan (Huronian) age. He also showed that irregular areas, often of very small size, and even thin crusts, due to a mere weathering, occur frequently in the Saint Peter's and Potsdam sandstones of Wisconsin, in which these sandstones have been changed to vitreous quartzites by the same mode of induration, *i. e.*, by the deposition of an interstitial quartz which has divided itself off into interlocking areas optically continuous with the original grains of quartz sand.

---

<sup>2</sup> So-called "crystallized" sands and sandstones have been described by many authors, beginning with Gerhard, in 1816, but none of them, so far as we have yet learned, understood that the crystal-faced grains were rolled fragments enlarged by secondary deposition. The idea with regard to these sandstones appears to have been that their crystal-faced grains were wholly separated out from solution, and the sandstones not really of clastic origin. Zirkel (Petrographie, II, p. 575) says of these crystallized sandstones that they "vielleicht gar nicht zu den klastischen Gesteinen gerechnet werden dürfen." See also Naumann's Geognosie, I, p. 530, and Von Cotta's Lithology, Lawrence's translation, pp. 296, 301. Zirkel (Petrographie, II, p. 590) gives a number of references among the older writers, but so far as I have been able to refer to them none seem to have had any idea of the true nature of the crystals.

Daubrée, who described the Vosges crystal-bearing sandstone as long ago as 1852, has quite recently (Études Synthétiques de Géologie Experimentale, 1879, pp. 226-230), in a résumé of earlier observations by himself and others (Elie de Beaumont, Hoffman, Gutberlet, Croisnier) on crystallized sands, stated distinctly his belief in their purely chemical origin. The Vosges sandstone, which is mentioned by Sorby (*loc. cit.*) as an admirable instance of the formation of crystallized sands by the enlargement of rolled grains, Daubrée cites as a typical instance of a sandstone of chemical origin. While admitting the occurrence of instances where it is difficult to see any such connection, he advances the view that, in the cases of the Vosges sand and many others, the deposit of crystals of quartz has been derived from a solution of an alkaline silicate supplied to the sea by the decomposition, before complete cooling, of masses of eruptive feldspathic porphyry, or of porphyry tuffs—a view which receives no substantiation from our own observations.





CRYSTAL-FACED ENLARGEMENTS OF QUARTZ FRAGMENTS.

A. H. ROSEN & CO. LITH.





The latter observations were made in the beginning of 1883, but in ignorance of Sorby's results, announced some years before. Several other lithologists had in the mean time made similar observations. In the summer of 1881, Arnold Hague and Iddings noted this form of induration in the Silurian, Devonian, and Carboniferous quartzites of the Eureka district of Nevada, and Mr. Iddings prepared some drawings at the time which will appear in Hague's monograph of that district.<sup>3</sup> Bonney, Phillips, and others have made similar observations in Europe.<sup>4</sup> The peculiar induration due to weathering had also been previously observed both in Europe and in this country,<sup>5</sup> although it does not appear that the exact nature of the induration was in any case understood.

Since the publication, by the senior author of this bulletin, in the American Journal of Science, above referred to, we have been engaged in studying sandstones, quartzites, and other rocks from various formations, with a view of determining how widespread this mode of induration is. Our attention has been mainly turned to rocks of pre-Cambrian age, but, whenever we have been able to procure the material, we have studied also rocks of more recent formations down to the Cretaceous. From the list given below it will be seen that we have found this peculiar form of induration in rocks representing nearly all of the various Huronian areas of the Northwest, as well as in a number of quartzites and sandstones of various degrees of induration from the later formations. We have also noted a number of interesting new points in this connection.

The most important result of our study is, of course, the proving that most, if not all, of the ancient quartzites, as well as many of the quartziferous schists, are composed in the main of the original fragmental material, unaltered save by some of the ordinary metasomatic processes, but the fragments cemented together by a very subordinate quantity of a siliceous cement of secondary origin. This siliceous cement forms the only part of the rock that has crystallized *in situ*, the more or less intricate interlocking of its areas and its common optical continuity with the original quartz fragments giving rise to a deceptive appearance of complete original crystallization.

The least advanced condition of this process of induration is to be met with in sandstones that are quite loose, as was shown by Sorby. The rolled grains of quartz are each furnished with a border of newly deposited quartz, optically continuous with the nucleus, and furnished with more or less perfectly developed crystalline faces. At times the fragment is only partially buried by the newly deposited border, this being especially true of the more irregularly outlined grains, but more

<sup>3</sup> Monographs of the United States Geological Survey, not yet issued.

<sup>4</sup> Q. J. G. S., Vol. XXXIX, p. 20.

<sup>5</sup> A. Geikie, Text Book of Geology, pp. 158, 333. M. E. Wadsworth, Science, Vol. I, p. 146.



usually the grain is completely, though very thinly, covered, so that we have thus formed a quite perfect quartz crystal, whose greater part is, in each case, mainly composed of the old and worn grain. These crystal-faced borders we have observed running in thickness from films so thin as to be barely perceptible with the microscope to those 0.2 or 0.3<sup>mm</sup>. in width. The presence of these crystal faces makes the surface of the sandstone affected by this induration sparkle and glisten like a frosted surface. Such crystalline sandstones have been known for a long time, and they are common in all formations from the Archæan to the Tertiary. Indeed, since our attention was first drawn to this matter, it has seemed to us as if the presence of at least some of the crystalline faces in quartzose sandstones is rather the rule than the exception. There can be no doubt, we think, that all owe their sparkling appearance to this same process of secondary enlargement of the original fragments. The crystalline faces are best developed, as already said, in loose sandstones, where the induration has not gone far enough to produce much interference, but they may coexist with a considerable degree of induration. The crystal-faced enlargements of the fragments in such sandstones may generally be separated from the nucleal grains by the presence of films of iron oxide on the surfaces of the nuclei, by the greater freedom from inclusions of the newly deposited as compared with the nucleal quartz, by the existence of a roughened surface on the inner grain, and by rows of cavities at the junction of the new quartz with the corroded surface upon which it was deposited.

Cases are met with in which it is exceedingly difficult to separate the two quartzes from each other. Sorby<sup>6</sup> mentions as such an instance the "Gannister" of the South Yorkshire coal field, and in our own experience we have met with two instances, those of the Huronian sandstones of Spurr Mountain, Michigan, and Penokee Gap, Wisconsin, both of which are alluded to in the list given below. The difficulty in all these cases arises from the great relative purity of the original quartz particles and the entire absence of an iron oxide coating to the nuclei, and, in the last two cases at least, from the smallness of the grains; but, in all, careful search discovers grains in which the separating lines may be perceived; and no doubt remains that in these cases also the crystals are enlargements of rounded fragments. These observations are of particular interest, since they render it evident that a completely indurated rock, apparently made up entirely of originally deposited quartz, may yet be only apparently so, the lines of separation between the new and old material being imperceptible.

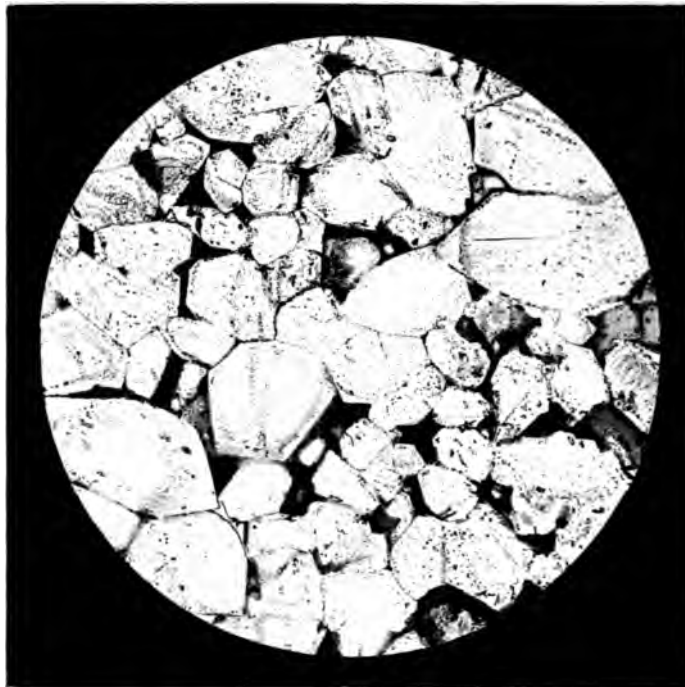
In the very loose sandstones the nuclei and deposited quartz are best distinguished from one another by mounting the sand crumbled from the rock in balsam, while the crystalline faces are best seen in a dry mounting of this sand.

The whole process of enlargement in these crystal-bearing sandstones is of course, as Sorby shows,<sup>7</sup> precisely analogous to what is known to

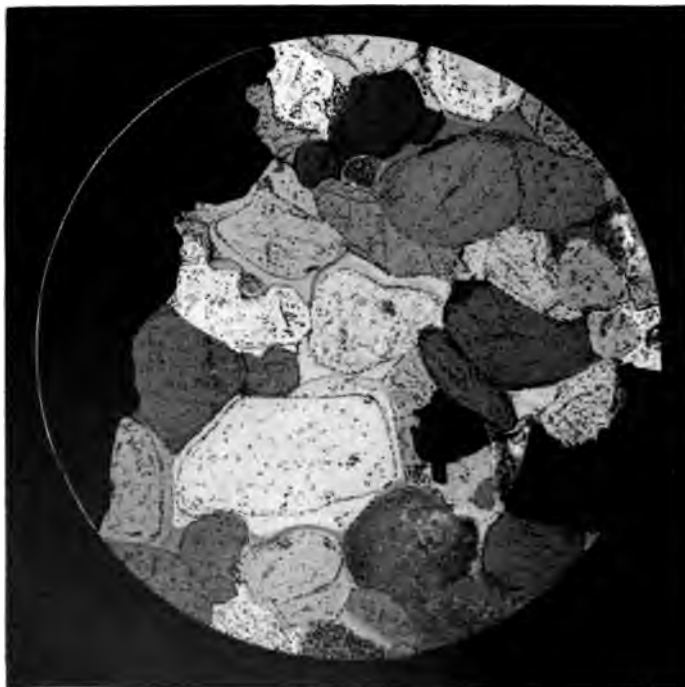
<sup>6</sup> *Loc cit.*, p. 63.

<sup>7</sup> *Loc cit.*, p. 62.





1



2

THIN SECTIONS OF QUARTZITES.



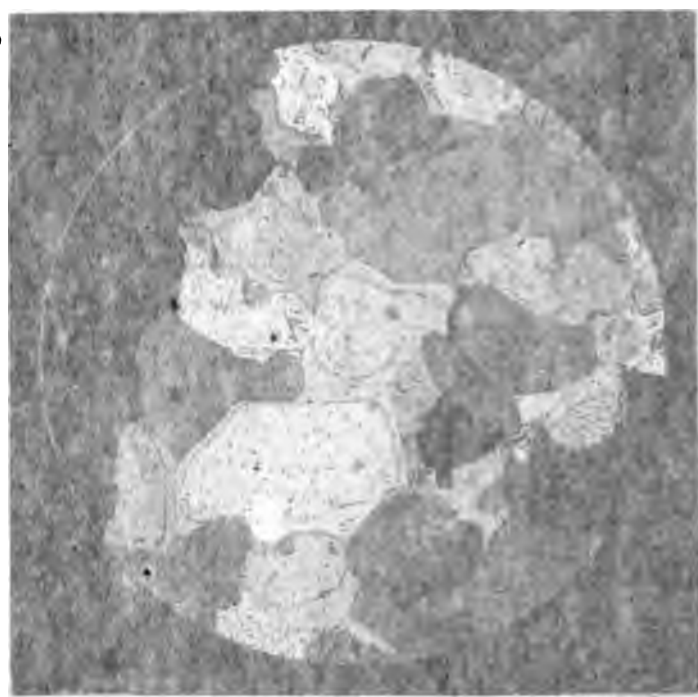
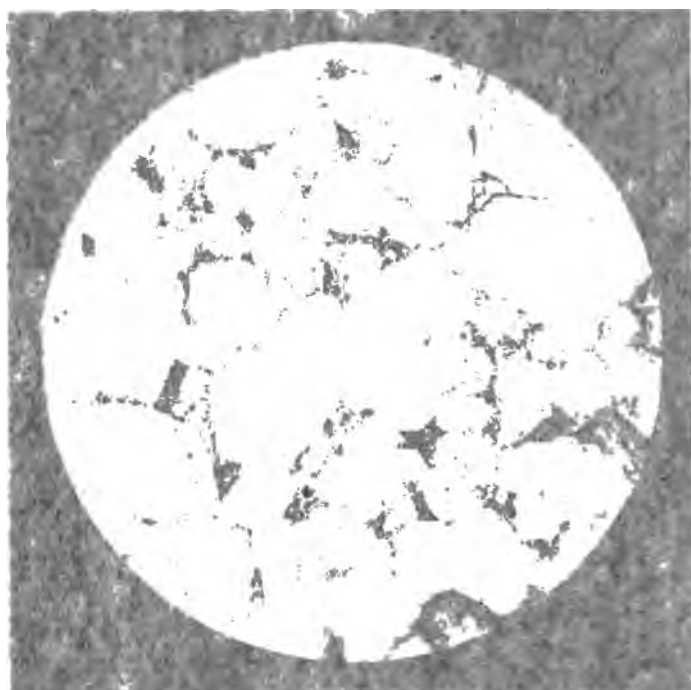


Figure 1. (a) and (b) are photomicrographs of the same area.

occur when a crystal of a soluble salt is placed in an evaporating saturated solution of the same substance. We have tried this experiment with fragments, from one-eighth inch to one-half inch in diameter, of alum ( $K_2 Al_2 (SO_4)_4$ ), nickel ammonium sulphate ( $(NH_4)_2 Ni (SO_4)_2$ ), and sodium and potassium tartrate ( $Na K (C_4 H_4 O_6)$ ). The fragments in each case were thoroughly rounded and coated with iron oxide. Being then hung each in its appropriate solution, the angles and faces were soon rapidly developed, after which the crystal continued to grow over the whole surface. Sections made from these crystals showed the nuclei bounded by oxide of iron films and built out by newly deposited material with precisely the relations met with in the enlarged grains of crystal-bearing sandstones.

As instances of localities yielding sandstones with crystal-faceted grains may be mentioned the following: For Huronian sandstones—East Neebish Island, St. Mary's River, Canada; Spurr Mountain, Michigan; Penokee Gap, Ashland County, Wisconsin; Devil's Lake, Sauk County, Wisconsin; Redstone, Nicollet County, Minnesota. For Potsdam sandstone:—New Lisbon, Juneau County, Wisconsin; the great bluff known as Roche Écrite, Adams County, Wisconsin, and the railroad cut on the Chicago and Northwestern road just south of Madison.<sup>8</sup> For St. Peter's sandstones—Arlington Prairie, Columbia County, Wisconsin; Lancaster, Grant County, Wisconsin.

Plate II shows a number of instances of crystal-faced enlargements of quartz fragments. Fig. 1 of this plate shows a single grain of the sandstone intercalated in the Huronian quartzite of East Neebish Island, St. Mary's River, enlarged 67 diameters. The outlines of the crystal faces, which are more or less interrupted from lack of material, were drawn in from a dry mounting of the grain, after which it was covered with balsam, and the nucleal fragment, with its oxide of iron coating, drawn. Fig. 2 shows another grain from the same sandstone, enlarged 67 diameters, as seen in a balsam mounting. Fig. 3 represents a single grain from the Huronian sandstone of Spurr Mountain, Michigan, as seen in a balsam mounting. The enlargement is 100 diameters. Figs. 4, 5, and 6 show the appearance, in the balsam mounting, of single grains from the Potsdam sandstone of New Lisbon, Wisconsin, enlarged 95 diameters. Figs. 7 and 9 are similarly mounted single grains from the Potsdam sandstone of the quarry on the Torch Lake Railroad, Keweenaw Point, Michigan, enlarged 67 diameters. Fig. 8 is a portion of a thin section of the same sandstone, also enlarged 67 diameters, and drawn as seen between the crossed nicols, with the object of showing how the nucleal fragments and enlargements polarize together. The black lines on two of the grains in this figure indicate the positions of the elasticity axes. The black spaces are holes in the section.

<sup>8</sup>This is the layer described in the Wisconsin reports under the name of the Madison sandstone. The occurrence of crystal-faceted grains in the more siliceous and looser portions of this layer appears to be an all but universal phenomenon in Southern Central Wisconsin.

A more advanced condition of induration is met with in certain sandstones, which, while still showing to some extent the crystalline facets, have the secondarily deposited quartz areas more generally interfering with one another. This may be seen in much of the Huronian quartzite at Neebish, Saint Mary's River; Redstone, Minn.; and Devil's Lake, Wis.—at all of which localities may be seen rapid transitions from the loosest sandstone to the most compact and vitreous quartzite, as also in much of the Potsdam sandstone of the interior of Wisconsin, for instance the rock quarried at Grand Rapids, Black River Falls and Packwaukee. Fig. 1 of Plate III is drawn from a section of the vitrified crust of the St. Peter's sandstone of Arlington, Columbia County, Wisconsin. This crust, which is described somewhat fully on a subsequent page, is immediately below the surface without crystalline facets, the enlargements having interfered too thoroughly. But at a depth of one-fourth to one-half an inch the crystal facets begin to grow plentiful, until the loose sandstone is reached at the depth of about an inch or two, when every grain is furnished with the facets. The figure referred to shows one of the intermediate phases where there has been some interference, but crystal facets have been enabled to form in a number of places. The outlines of the nucleal grains are distinctly but not strongly marked. The brown filling material is oxide of iron.

A still more advanced stage of induration, but yet one which is still short of complete vitrification, is met with in those quartzites, which, while retaining something of a granular or arenaceous appearance, are yet without any of the crystalline facets, the interference of the secondary quartz areas having been general. An excellent instance of this is the sandstone from Gibraltar Bluff, Columbia County, Wisconsin. Much of a similar material occurs in the Huronian quartzites of the north shore of Lake Huron, of Marquette, Mich., and of Southwestern Minnesota. The Gibraltar Bluff rock is shown at Fig. 1 of Plate V, which represents part of a thin section, as seen in the polarized light, enlarged 35 diameters. A more arenaceous quartzite, but still one without crystal faces, is shown at Fig. 2, Plate III, which represents a thin section of the sandy Animikie quartzite of Portage Bay Island, Minnesota. The enlargement is 45 diameters, and the section is represented as seen in the polarized light. It will be noted that the enlargements of the grains are at times unusually broad.

In the most completely vitreous quartzites the arenaceous or granular appearance is entirely lost, the particles being fused into an apparently homogeneous mass, which appears both to the naked eye and under the microscope to be wholly composed of originally deposited, intricately interlocking areas of quartz. But closer study of the sections of such quartzites shows that, like those previously described, they are made up partly of fragmental material and partly of a secondarily deposited

quartz, the interlocking areas of the latter being in large measure optically continuous with the original fragments, but also at times in part independent of them. The degree of intricacy of the interlocking of the areas of the secondary quartz will be found to vary greatly in different quartzites. At times these areas will meet each other along quite straight or only slightly curved lines, and again they will dovetail into each other in the most intricate manner. As a type of the most completely vitrified quartzites, may be mentioned the "gannister" of Marquette, Mich., No. 22 of the list below. A thin section of this rock, as seen in the polarized light, and enlarged 31 diameters, is represented in the upper half of Fig. 1, Plate VI. It will be seen that the enlargements are often unusually broad and dovetail with each other somewhat intricately. Other vitreous quartzites are shown at Fig. 2, Plate V; Figs. 1 and 2 of Plate IV, and the upper half of Fig. 2 of Plate VI. The last three of these figures represent the red Animikie quartzite of Prairie River Falls, Minnesota. The rock of this place is described as being much of it sandy, but the specimen furnished us by the kindness of Prof. N. H. Winchell shows a quartzite in which but little of an arenaceous texture remains. Two of the figures are drawn from the section as seen in the polarized light, in order that the extent of the enlargements may be seen. It will be observed that in places they dovetail quite intricately and the outlines of the very round nucleal fragments are rendered beautifully distinct by the fringes of oxide of iron.

The proportion of the infiltrated quartz which has crystallized independently of the original fragments varies very greatly in different cases. At times most of it, or even all, seems to occur in this form, the interstices between the much-rounded fragments being entirely filled with a secondary quartz in minute intricately interlocking areas, wholly independent of the original grains. As instances of rocks in which the independent deposition of quartz is the chief or only indurating material, may be mentioned the foot-wall rock of the Champion Mine, Michigan, much of the quartzite of the great range immediately east of Marquette, Mich., and the red quartzite of McClennan's Landing on the north shore of Lake Huron. From these extreme cases there are all phases down to the cases where all of the secondary quartz occurs as enlargements of the original fragments.

Thin sections of quartzites in which the fine interstitial quartz is present are not easily represented by figures. At the lower half of Fig. 1, Plate VI, an attempt is made to represent the Huronian quartzschist from near Marquette. The section is drawn as seen in the polarized light and is enlarged 36 diameters.

In some cases where the enlargements of the original grains and the independently oriented quartz occur together, the enlargements present the appearance of fading out gradually into the finely interlocking interstitial material. This appearance arises from the fact that as the original fragment is receded from, less and less of the interstitial quartz



is optically continuous with it, while more and more is separated out into relatively minute independent areas. It is thus evident that all of the interstitial quartz, including both that which is in independent areas and that which is oriented with the original fragments, has been deposited simultaneously, the crystalline influence of the fragment having lessened rapidly in power as the distance from the fragment increased. In those cases where all the interstitial quartz has been deposited independently of the original grains, the deposition went on too rapidly for those grains to exert their influence. The apparent fading out of quartz fragments also arises from another cause in the cases of certain argillaceous quartzites mentioned below.

In certain quartzites, that interstitial silica which has been deposited independently of the original fragments has in part separated out as chalcedonic or entirely amorphous silica. In fact, there is every gradation found in some of these cases from that quartz which is in independent areas of some little size, through more and more finely divided kinds, to that which is completely amorphous, presenting no perceptible effect when revolved between the crossed nicols. The amount of this cherty silica present varies between wide limits, in some cases predominating over the quartzose material, when the rock belongs more properly with the chert and chert-schists, which are considered separately below. The lower half of Fig. 2, Plate VI, shows the appearance in the polarized light of a thin section of a cherty Potsdam sandstone from Westfield, Sauk County, Wisconsin, enlarged 35 diameters. Most of the rock is taken up by the cherty matrix, but in this are buried quartz fragments of various sizes which have received small enlargements. The appearance of the upper side of the largest quartz grain of the figure suggests that it may have been dissolved away.

Commonly the quartz fragments of a sandstone or quartzite are fragments of single quartz individuals, but cases often occur where they are themselves complex, *i. e.*, made up of several or many differently oriented, interlocking areas. We have noted a number of cases where such complex grains have been enlarged, and in such cases the added quartz is divided off into areas oriented each with the part of the original grain with which it is in contact. This is very beautifully seen in the large grain of the upper half of Fig. 2, Plate VI, which is drawn from the red Animikie quartzite of Prairie River.

So far we have considered rocks that are purely quartzose, or nearly so, and it is in these that the enlargement of the quartzes is most striking, and generally most readily made out, but we have observed it also in a large number of rocks where the detrital material is composed more or less largely of other minerals than quartz, and even in cases where the quartz is a rather sparse accessory. A large part of the thickness of the original typical Huronian of Lake Huron is made up of gray to black fragmental rocks, grading from very coarse-grained

kinds to those that are almost aphanitic. These rocks Logan called collectively, on account of their frequently containing pebbles of various kinds, by the name of "slate conglomerates." This name, however, covers kinds which differ much from each other. Some are almost pure quartzites, with a slight mixture of feldspathic fragments. In other cases the feldspathic fragments predominate, and in the finer kinds have often been decomposed to a clayey material, when the rocks become clay shales or slates. Most of the kinds, except those that are nearly purely quartzose, have undergone a considerable amount of metasomatic change, the principal result of which has been the production from the feldspars of a chloritic ingredient, whence chiefly the dark and often greenish hue presented by these rocks.

In all of the sections of these rocks examined by us evidence has been found of the secondary deposition of interstitial quartz. In a few cases this interstitial quartz has been deposited independently of the original quartz fragments, but oftener is more or less generally co-ordinated with them. Not only have the quartz areas of these rocks been enlarged, but the feldspar fragments also often present indications of similar enlargement.<sup>9</sup> The complex character of these rocks, the metasomatic alteration which they have undergone, their dark color, and the siliceous paste by which they have been permeated, place them among "greywackes,"<sup>10</sup> whilst the finer-grained and more fissile kinds are "greywacke-slates." These greywackes, which are, next to the quartzites, the most characteristic and important rocks of the type Huronian, are all "recomposed" rocks, and often, especially where the secondary quartz is abundant, and the alteration from feldspar to chlorite has progressed far, are not far in appearance, either macroscopically or microscopically, from true crystalline rocks, and would ordinarily be classed as metamorphic. Nevertheless they have undergone no other alteration than that which is involved in the secondary enlargement of quartz and feldspar particles, the metasomatic change of feldspar to chlorite, and the interstitial deposition of independently oriented quartz; and all of those changes are such as may be met with in the more recent and so-called unaltered formations. Indeed, we may say, setting aside those changes to be met within the immediate vicinity of the contact with eruptive materials, that in the typical Huronian, *i.e.*, that mapped by Logan as extending from the Saint Mary's to the Mississauga River on the north shore of Lake Huron, there has been no other kind of alteration of sediments than this, the various greenstone beds of the series being taken as of eruptive origin.

Greywackes and greywacke-slates, with characters in each case of their own, but in general similar to those of the Lake Huron series, we have examined from the Animikie series of the region of Thunder Bay, and thence westward along the national boundary line, from the Huro-

---

<sup>9</sup> See *infra*, p. 27.

<sup>10</sup> Geikie's *Text Book of Geology*, p. 159.

nian of the Penochee region of Wisconsin, and from the folded slaty series of the region of Knife Lake on the national boundary line. All of these are plainly fragmental, being composed mainly of quartz and feldspar fragments, and permeated to a marked degree by a quartzose cement whose areas are always more or less generally optically continuous with the original quartz particles. A belt of rocks, composed of dark-colored sandstones and shales, which would come under Geikie's definition of greywackes and greywacke-slates, forms a prominent member of the Keeweenaw series between Keeweenaw Point and Bad River in Wisconsin, reaching a particularly large development in the region of the Porcupine Mountains. This is the belt which we have elsewhere described under the name of the Nonesuch Belt.<sup>11</sup> In many sections of this rock an interstitial quartz, occurring as enlargements of the original particles, is met with, and is particularly abundant in sections from that portion of the Porcupine Mountains known as the Iron River Silver Belt.<sup>12</sup> These greywackes, and particularly those of the silver belt, are no less metamorphic than the greywackes of the type Huronian, and yet they occur interstratified in a great thickness of unaltered sandstones. Moreover, they lie in that series many hundred feet above the latest of the great flows of eruptive material which characterize it, so that the alteration can in no way be attributed to igneous action.

Argillaceous rocks are not promising ones for the discovery of enlargements of quartz particles, and yet we have noted in them a number of instances of such enlargements, as, for example, in the cleaved slates of the Saint Louis River region of Minnesota, and in the Marshall Hill schists of the Upper Wisconsin Valley, in Central Wisconsin.<sup>13</sup> Mention has been made in a preceding paragraph of the peculiar way in which the enlargements of quartz fragments in certain quartzites are made to appear as if fading off gradually into the fine interstitial material. A somewhat similar appearance, but one which is evidently due to a quite different cause, is met with in these argillaceous rocks, in which the enlargements of the widely separated quartz fragments have enveloped, in the process of growth, portions of the clayey matrix.

In nearly all of the schistose areas of the Northwest which have been by us or other geologists referred to the Huronian, cherty rocks—that is, rocks more or less largely composed of a chalcedonic or amorphous silica—form considerable thicknesses. They are present in the Animikie series of the Thunder Bay region, in the folded slates of the region farther north, in the original Huronian of Lake Huron, in the iron-bearing series of the Marquette and Menomonee regions of Michigan, and in the Penochee and Wisconsin Valley regions of Wisconsin. At least some of the jaspers associated with the “jaspery iron ores” are of

<sup>11</sup> Copper-bearing rocks of Lake Superior. Monographs of the U. S. Geological Survey, Vol. v, pp. 220-224.

<sup>12</sup> *Loc. cit.*, p. 221.

<sup>13</sup> Geology of Wisconsin, Vol. IV, pp. 668, 681 to 683.

this nature. We are still engaged in a general study of these cherts, jaspers, etc., and are not yet prepared to give a systematic account of them. But there are several features that we have noted in regard to them that are of interest in the present connection. At times these cherts are for a considerable thickness wholly composed of chalcedonic silica, but in other cases they contain fragments of quartz, in smaller or greater quantities, up to a predominating amount. In such cases we have frequently noted that the quartz fragments are enlarged in the ordinary manner. These cherts seem, in part at least, to be of direct chemical origin, and the appearance in the thin sections is as if the quartz fragments had taken an enlargement of quartz simultaneously with the deposition of the mass of the amorphous silica. In these cherty rocks the enlargements of quartz fragments present the appearance of fading away gradually into the matrix material in a manner similar to that already noted in the case of certain quartzites, where the appearance has been explained by the lessening of the crystalline influence of the original particles, and the formation of more and more of independently oriented matter, as they are receded from. Here, however, we find a gradation all the way from the areas deposited so as to be optically continuous with the original quartz fragments, through a fine interlocking, independently oriented quartz, to the chalcedonic material.

There are many points as to the origin of these cherts which are yet obscure, chiefly because of the small amount of microscopic study given to them. We think, however, that it may be taken as certain that the Huronian cherts have in considerable measure originated in the same way as the cherts of the later formations. In the Potsdam sandstone, for instance, at a number of points in the region of the Upper Baraboo River, in Central Wisconsin, layers of sandstone are to be noted which are highly impregnated with chert, and in which at times the chert even predominates over the sand. Chert is ordinarily thought of as a characteristic of limestone formations, but the cherts of this region are wholly below and independent of any limestone formation. Evidently these cherty layers have been produced by the secondary deposition from solution of the interstitial cherty material, and they do not appear to differ, either as to the nature of the material or as to its origin, from some of the true Huronian cherts. These Potsdam cherty sandstones give interesting sections, in which the interstitial secondarily deposited material presents every degree of coarseness, from large areas optically continuous with the original quartz fragments to the finest, most completely non-polarizing amorphous silica.

Our sections of true mica schists are not yet very numerous, but we have found unmistakable enlargements of quartz fragments in the mica-schist forming part of the "Lower Quartzite" of Brooks, north of the Michigamme mine, Marquette region, Michigan, and in the more quartzitic portions of the upper mica-schist member, Formation XXI, of

the Penokee Huronian.<sup>14</sup> This member of the Penokee series is plainly the equivalent of the upper mica-schist member of the Marquette Huronian.<sup>15</sup> The latter mica-schist is finely displayed among the islands at the outlet of Michigamme Lake, where it is often plainly of an arenaceous appearance, but so far our sections have failed to prove the existence of secondary enlargements of quartz fragments in them, although what appears distinctly to be fragmental quartz is seen in these sections. The larger part, however, of the quartz present is fine and clear, so that it is difficult to determine whether it is wholly an originally deposited quartz or is a finely fragmental material, the particles of which are now so enlarged as to interlock.

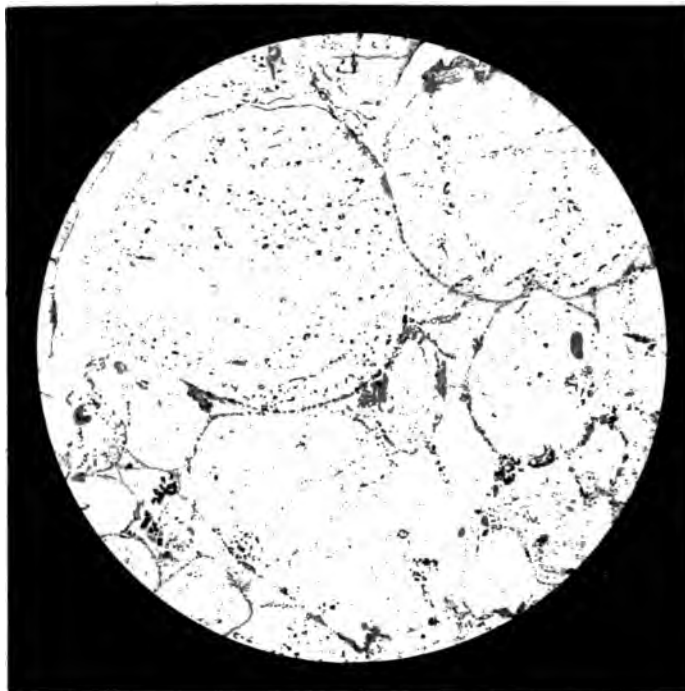
A general fragmental appearance is not uncommon in the mica-schist sections that we have examined, while the presence, in some kinds at least, of very strongly marked and unmistakable sedimentary deposition bandings traversing the schistose or slaty cleavage directions is sufficient proof that in such cases the material is mainly of fragmental origin. But so far as our investigations have progressed we have only in a few cases been able to prove the enlargement of quartz fragments by secondary deposition. It seems probable, however, that in many cases where their existence cannot be proved the enlargements exist. In such cases we may suppose that they cannot be seen simply because of the absence of a bordering material or of roughened surfaces to the original fragments. None of the mica-schists above referred to are like those which approach the gneisses in character. The latter have often as a characteristic feature large flattened areas of quartz lying in the planes of foliation. We have not as yet examined any such rocks in this connection.

Below we give a list of the various localities of rocks in which we have discovered the secondary enlargements of quartz fragments. The induration of the rocks of these places is in most cases mainly due to the presence of these secondary enlargements, the remainder of the material being fragmental, but cases are included where, as explained above, the indurating silica has been separated out in part independently. The list does not represent nearly all of the sections in which this indurating quartz has been found. Often a number of sections from the rocks from one general neighborhood have been examined, but the locality is only referred to once. We have classified the localities (1) according to the general position of the rocks in the geological series; (2) according to geographical distribution; and (3) according to the lithological characters. Brief descriptive notes are added in each case.

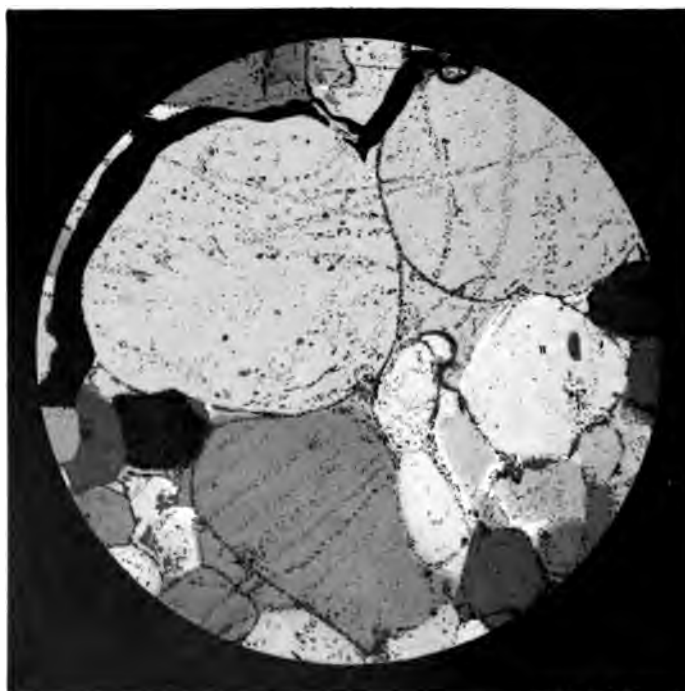
<sup>14</sup> *Geology of Wisconsin*, pp. 145-149.

<sup>15</sup> *Geological Survey of Michigan*, Vol. I, p. 113. *Geology of Wisconsin*, Vol. III, p. 165.





1

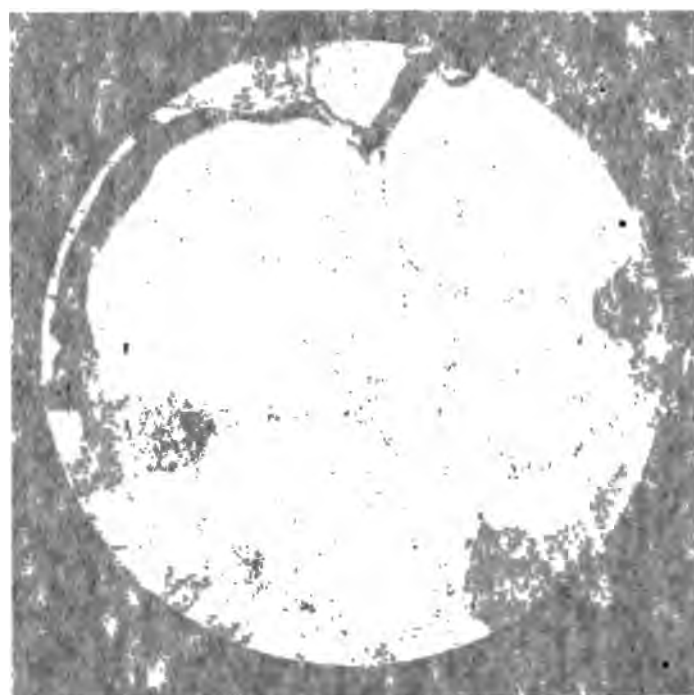
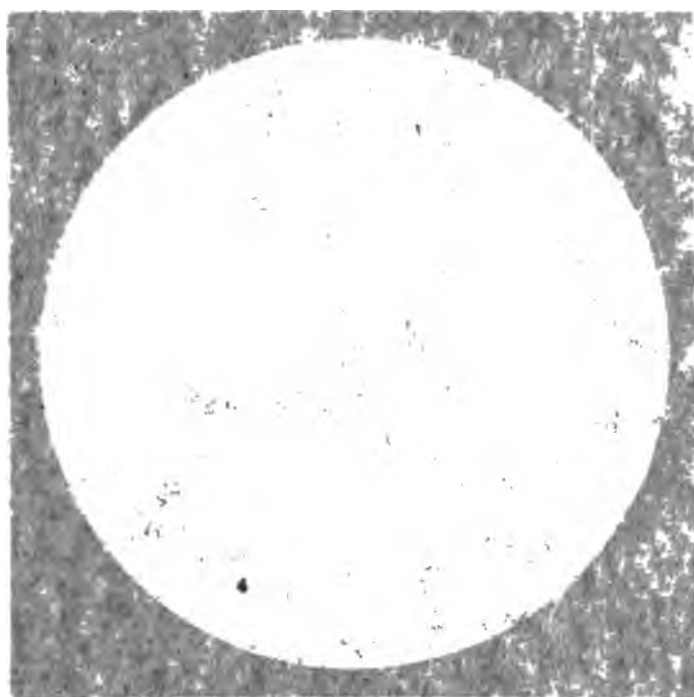


A. D. S. & Co. Lith. Baltimore.

THIN SECTION OF RED QUARTZITE







## LIST OF LOCALITIES.

## HURONIAN ROCKS.

## IN THE TYPICAL HURONIAN REGION OF LAKE HURON.

A.—*Vitreous Quartzites.*

1. Island two miles east of Thessalon Point, north shore of Lake Huron. (Logan's "3 a," "Grey Quartzite."<sup>14</sup>)

A feldspathic quartzite, holding many granite pebbles and boulders. Rounded to angular fragments of quartz, orthoclase, and oligoclase, with a fine interstitial material, partly of the same nature and partly kaolinitic, make up most of the rock, but the induration is plainly due to secondary enlargements of the quartz fragments, the enlargements being narrow, and not interlocking intricately. In places the angularity and abundance of the feldspar fragments, the occurrence of granite fragments, including both feldspars and quartz, and the presence of the secondary enlarging silica, produce a rock which is macroscopically and microscopically similar in appearance to granite or gneiss. (Slides 1071 to 1079 inclusive.)

2. Islands  $3\frac{1}{2}$  miles northwest of Thessalon Point, north shore Lake Huron. (Logan's "3 c," "White Quartzite.")

A feldspathic quartzite. Quite intricately interlocking quartz areas make up the larger part of the rock, but the interlocking is plainly due to the enlargement of rounded fragments, whose outlines are here and there plainly to be seen. There is also much of a fine interstitial independently deposited silica, which here and there approaches very close to, if it does not reach, the amorphous form. (Slides 1183, 1184.)

3. Mainland, four miles northwest of Thessalon Point, north shore Lake Huron. (Logan's "3 c," "White Quartzite.")

A vitreous, white to brown quartzite conglomerate, in which the pebbles, 1 to 2 inches in diameter, are of white quartz and black chert, with rarer ones of red jasper. The matrix is composed of the same materials, along with fragments of feldspars. The induration has been chiefly by enlargement of the quartz fragments, among which are some originally complex. These have taken complex enlargements. The bounding lines of the original quartz fragments are only now and then perceptible. The larger pebbles of quartz do not seem to have taken any enlargements. There is also some fine independently deposited interstitial silica and a good deal of interstitial clayey material and flakes of chlorite, the latter probably a result of metasomatic change of the feldspars. (Slides 1185 to 1188 inclusive.)

4. Islands off east side Bruce Mine Bay, Lake Huron. (Logan's "3 c," "White Quartzite.")

A light-colored feldspathic quartzite, much like the last described, but with these differences: the quartz areas interlock much more intricately; the division lines between the original grains and enlargements are still more rarely visible, being plain in only two or three out of some twenty sections; the feldspars are much more abundant, and include microcline and plagioclase, as well as orthoclase. This rock has plainly received a larger quantity of siliceous cement than the last described. The abundance of feldspars, the presence of plagioclases, the intricate enlargements produced by secondary quartz, and the presence of much chlorite as a result of the alteration of the feldspars, all combine to produce a strong resemblance to some gran-

(<sup>14</sup>) See Atlas to Geology of Canada, 1863, Plate III, for Logan's subdivisions of the original Huronian.

## 24 SECONDARY ENLARGEMENTS OF MINERAL FRAGMENTS. [BULL. 2.]

itic rocks. The specimens are mostly taken from the neighborhood of some of the numerous dikes with which the rock is riddled, which may possibly have something to do with the large amount of siliceous cement and the consequent granitic appearance presented by this rock. (Slides 1191, 1192, 1194, 1196, 1197, 1201 to 1205 inclusive.)

### 5. North side of Campement d'Ours Island, Lake Huron. (Logan's "3 f," "Upper Slate Conglomerate.")

A red feldspathic quartzite, the feldspars including both orthoclase and plagioclase, the two together making up fully one-half of the rock. The quartz fragments are much enlarged, the enlargements interlocking with each other and with the feldspars somewhat intricately. There are present interstitially kaolin, chlorite, and oxide of iron, but only a very little fine secondary quartz. (Slide 1224.)

### 6. South side Campement d'Ours Island, Lake Huron. (Logan's "3 f," "Upper Slate Conglomerate.")

A feldspathic quartzite, the feldspars including both orthoclase and oligoclase, but not nearly so plenty as in the rock last described. The quartz fragments are very much enlarged, so as to interlock intricately. The lines of division between the enlargements and the original fragments are only rarely satisfactorily seen, some sections being quite without them. That the interlocking quartz areas of this rock are due to enlargement of quartz fragments would never be suspected but for their previous discovery in other similar rocks and in other parts of this same layer. Only a very small quantity of the interstitial quartz in this rock appears to have crystallized independently of the original fragments. (Slide 1226.)

A number of rocks on the west and south sides of Campement d'Ours, belonging with the same member of the series as the above, were examined, and all showed essentially the features above noted.

### 7. North shore of Lake Huron, two miles east of McClennan's Landing. (Logan's "3 f," "Upper Slate Conglomerate.")

A purple, vitreous, non-feldspathic quartzite, composed chiefly of rounded quartz grains, which have rarely, if ever, received any enlargement, and consequently do not interlock. Interstitially finely-divided secondary silica has been deposited, in part in an amorphous form. There is also a good deal of kaolinic material in the interstices. The presence of this material and also of a small quantity of iron oxide and the absence of enlargements give the sections of this rock just the appearance of those of an ordinary sandstone. Nevertheless it is much indurated, and the induration is plainly due to the independent secondary deposition of interstitial silica. (Slide 1233.)

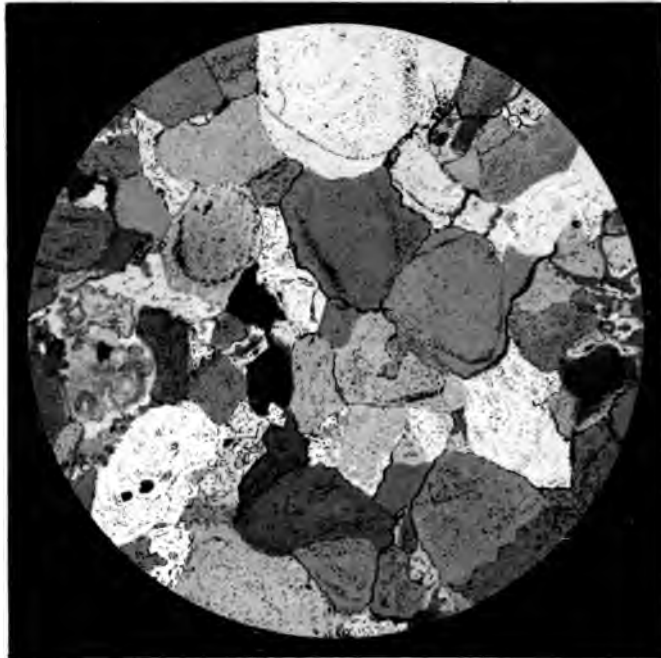
### 8. McClennan's Landing, north shore of Lake Huron. (Logan's "3 g," "Red Quartzite.")

A light-red, non-feldspathic quartzite. This rock is a good deal like the last described, the induration being mainly due to the independently oriented interstitial silica, but the quartz fragments are, for the most part, somewhat enlarged. (Slide 1238.)

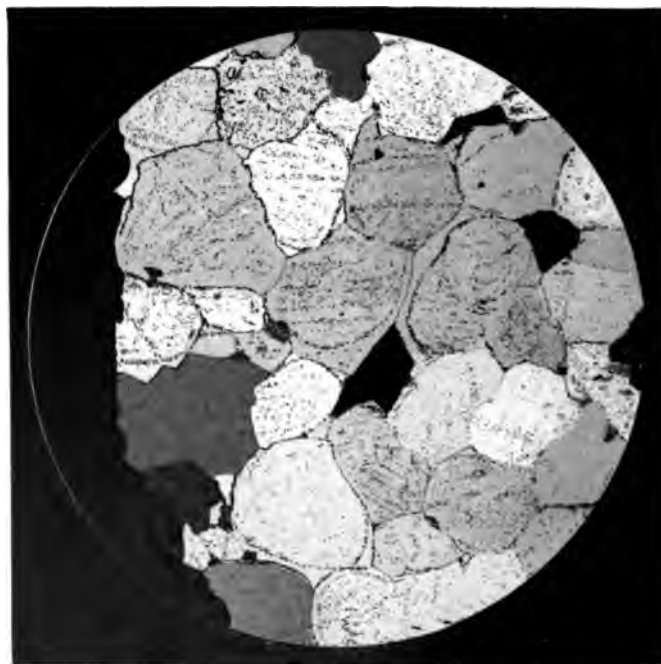
### 9. Two miles west of McClennan's Landing, north shore of Lake Huron. (Logan's "3 k," "Red Jasper Conglomerate.")

A white quartzite, made up chiefly of quite large quartz grains, all of which are more or less enlarged, though the bounding lines of the original fragments are only here and there perceptible. There is, however, not much interlocking of the quartz enlargements, there being a good deal of interstitial material in the shape of kaolin, muscovite scales, and finely-divided quartz. (Slide 1239.)





1



2

A. Hoot & Co. Lith. Baltimore

THIN SECTIONS OF SANDSTONE AND QUARTZITE.

11. *Section of the "Conglomerate" of Lake George, Saint Lawrence River.*

This section is a typical example of the "Conglomerate" of Lake George, Saint Lawrence River. It is a fine-grained, light-colored, siliceous material, composed of small, rounded pebbles of quartz, feldspar, and other minerals, embedded in a fine, siliceous matrix. The pebbles are generally less than 1/4 inch in diameter, and are often found in clusters. The matrix is a fine, siliceous material, composed of small, rounded pebbles of quartz, feldspar, and other minerals, embedded in a fine, siliceous matrix. The pebbles are generally less than 1/4 inch in diameter, and are often found in clusters.

12. *Section of the "Conglomerate" of Lake George, Saint Lawrence River.*

This section is a typical example of the "Conglomerate" of Lake George, Saint Lawrence River. It is a fine-grained, light-colored, siliceous material, composed of small, rounded pebbles of quartz, feldspar, and other minerals, embedded in a fine, siliceous matrix. The pebbles are generally less than 1/4 inch in diameter, and are often found in clusters. The matrix is a fine, siliceous material, composed of small, rounded pebbles of quartz, feldspar, and other minerals, embedded in a fine, siliceous matrix. The pebbles are generally less than 1/4 inch in diameter, and are often found in clusters.

13. *Section of the "Conglomerate" of Lake George, Saint Lawrence River.*

This section is a typical example of the "Conglomerate" of Lake George, Saint Lawrence River. It is a fine-grained, light-colored, siliceous material, composed of small, rounded pebbles of quartz, feldspar, and other minerals, embedded in a fine, siliceous matrix. The pebbles are generally less than 1/4 inch in diameter, and are often found in clusters. The matrix is a fine, siliceous material, composed of small, rounded pebbles of quartz, feldspar, and other minerals, embedded in a fine, siliceous matrix. The pebbles are generally less than 1/4 inch in diameter, and are often found in clusters.

14. *Section of the "Conglomerate" of Lake George, Saint Lawrence River.*

This section is a typical example of the "Conglomerate" of Lake George, Saint Lawrence River. It is a fine-grained, light-colored, siliceous material, composed of small, rounded pebbles of quartz, feldspar, and other minerals, embedded in a fine, siliceous matrix. The pebbles are generally less than 1/4 inch in diameter, and are often found in clusters. The matrix is a fine, siliceous material, composed of small, rounded pebbles of quartz, feldspar, and other minerals, embedded in a fine, siliceous matrix. The pebbles are generally less than 1/4 inch in diameter, and are often found in clusters.

15. *Section of the "Conglomerate" of Lake George, Saint Lawrence River.*

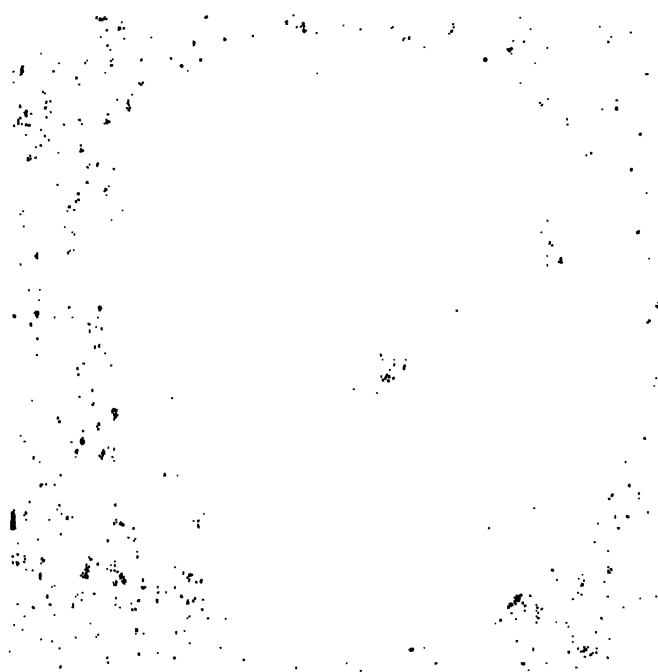
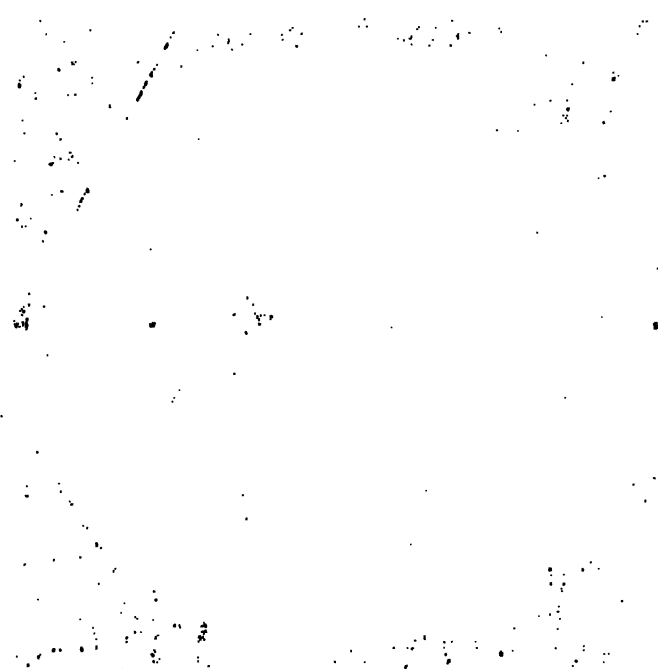
This section is a typical example of the "Conglomerate" of Lake George, Saint Lawrence River. It is a fine-grained, light-colored, siliceous material, composed of small, rounded pebbles of quartz, feldspar, and other minerals, embedded in a fine, siliceous matrix. The pebbles are generally less than 1/4 inch in diameter, and are often found in clusters. The matrix is a fine, siliceous material, composed of small, rounded pebbles of quartz, feldspar, and other minerals, embedded in a fine, siliceous matrix. The pebbles are generally less than 1/4 inch in diameter, and are often found in clusters.

f Lake George, Saint  
"Conglomerate.")

pebbles, one-fourth to  
re imbedded in a fine,  
terials. Under the  
perhaps sometimes  
quartz fragments  
and the outlines  
tz areas appear  
us page. This  
in progressed,  
re and more  
more of the  
inal grain

"3 i,"

on-  
ces  
4-



10. Near the mouth of Echo River, Canada side of Lake George, Saint Mary's River. (Logan's "3 h," "Red Jasper Conglomerate.")

A conglomeratic quartzite composed chiefly of clear quartz pebbles, one-fourth to one-half inch in length, with rarer ones of red jasper. These are imbedded in a fine, much-indurated matrix, apparently composed of the same materials. Under the microscope the matrix is seen to be composed of finely-divided, perhaps sometimes amorphous silica, with kaolinic material and oxide of iron. The quartz fragments are enlarged, but never so much as to interlock with one another, and the outlines of the original grains are often imperceptible. Some of the large quartz areas appear to fade away into the fine matrix in the manner described on a previous page. This appearance is plainly due to the fact that, as the enlargement of the grain progressed, it became more and more difficult to thrust aside the clayey matrix, more and more of which was consequently included within the enlargements, more and more of the secondary silica at the same time departing from its allegiance to the original grain and depositing independently. (Slide 1242.)

11. North shore of St. Joseph's Island, Lake Huron. (Logan's "3 i," "White Quartzite.")

A gray, non-feldspathic quartzite. The induration is principally due to the enlargements of the original grains, which sometimes interlock closely, but in places there is a good deal of a fragmental matrix of kaolinic material, including muscovite scales, in which cases the grains sometimes appear to fade away into the matrix, as described in the preceding. The outlines of the original grains are often quite distinctly seen. (Slide 1228.)

12. East Neebish Island, St. Mary's River. (Logan's "3 i," "White Quartzite.")

A light gray to white quartzite. At times completely vitrified and without any trace of a fragmental appearance, but in other places a loose sandstone, with crystal faceted grains, there being every possible phase between those two extremes. In the thin section, the most completely vitreous kinds are found to be made up wholly of enlarged quartz fragments, there being none of the independently deposited interstitial silica or of any other interstitial material. The quartz areas interlock intricately, the outlines of the original fragments being everywhere strongly marked. In sections of the less completely vitreous kinds, a fine interstitial silica is to be seen in greater or less quantity. Some of the quartz fragments present the appearance of gradation into the matrix, due to the gradual change in the depositing silica from dependence upon the original fragments to independence of them. Fig. 2, Plate V, is drawn from the East Neebish quartzite. The arenaceous varieties of the East Neebish rock are noted below in another connection. (Slides 1019 to 1024, inclusive.)

13. Rocky islets in Saint Mary's River, northwest of Saint Joseph's Island, Lake Huron. (Logan's "3 i," "White Quartzite.")

These islands show a gray quartzite similar to that of Neebish Island. (Slides 1025, 1028.)

14. McDonald Township, six miles east of Saint Mary's River, Canada. (Logan's "3 i," "White Quartzite.")

A white, completely vitreous quartzite, entirely similar to the most vitreous phase of the Neebish quartzite. The outlines of the original fragments are everywhere very plain in this section. (Slide 1240.)



26 SECONDARY ENLARGEMENTS OF MINERAL FRAGMENTS. [BULL. 8.

15. From near the mouth of Echo River, Canada side of Lake George, Saint Mary's River. (Logan's "3 i," "White Quartzite.")

A completely vitreous quartzite, similar to that of Neebish Island, except in having a very small quantity of interstitial kaolinic material. (Slides 1245, 1246.)

B.—*Schistose quartzites.*

16. Islands two miles southeast of Neebish Rapids, Saint Mary's River. (Logan's "3 i," "White Quartzite.")

Light-gray, argillaceous, schistose quartzites, differing from the non-schistose quartzites above described in containing a very large amount of a clayey matrix, and in the schistose structure. The rather unusually large quartz fragments are wholly separated from one another by the matrix, and, as is generally the case when there is much of a clayey matrix, the enlargements are but slight. Some of the quartz fragments are complex, and appear to have received complex enlargements. (Slide 1031.)

C.—*Sandstones.*

17. East Neebish Island, Saint Mary's River. (Logan's "3 i," "White Quartzite.")

Intercalated in and grading into the vitreous quartzite above described (No. 12) is a reddish, very coarse-grained, feebly indurated sandstone, each one of the grains being furnished with crystal faces from secondary enlargement. The crystal faces are in this case very much larger than in any other case that we have yet noted. Some of the grains, each a single quartz individual, reach as much as one-fourth inch in diameter, and have crystal faces of correspondingly large size, while half the mass of the rock is composed of grains which exceed one-sixteenth inch in diameter. Occasionally some of these grains are complex, but most of them are single individuals. The oxide of iron cement is very abundant, and the secondary enlargements of the grains have always between them and the original surfaces a heavy border of the iron oxide. Fig. 2, Plate II, represents one of these grains broken by hand from the rock, as seen in a balsam mounting enlarged 67 diameters. The crystal facets bounding the grain are not seen on this mounting, but only the rough, iron-stained surface of the original grain and the outlines of the pellucid enlargement. Fig. 1 of the same plate shows the positions of the crystal faces upon another grain, the positions of the faces having first been drawn in with the camera from a dry mounting, after which, without altering its position, the fragment was covered with balsam, and the kernel drawn in its position within the crystal. The very slight coherence of this rock as compared with the completely vitreous quartzite into which it grades within a few inches, is plainly to be attributed to the relatively coarse character of this rock, and to the supply of indurating quartz not having here been sufficient to fill out the large-sized interstices, and its having consequently developed crystalline faces. (Slide 1391.)

D.—*Graywackes.*

18. Palladreau Islands, north shore Lake Huron. (Logan's "3 d," "Lower Slate Conglomerate.")

A very dark greenish-gray, nearly black, fine-grained, compact rock, having an aphanitic matrix, in which are scattered minute particles of quartz and feldspar. Except for very sparsely scattered granite and porphyry pebbles, the appearance is more that of a very fine-grained porphyritic green-stone than that of a clastic rock. The clastic nature is, however, very evident in the thin section, which shows a ground-mass composed very largely of kaolin and chlorite, mingled with fine particles of feldspar and quartz, with more or less brown oxide of iron and magnetite.

The kaolin and chlorite are evidently the results of the alteration of the feldspathic portion of the matrix. Thickly scattered through this matrix are larger fragments of quartz and feldspar, between which and the particles of the matrix there is every gradation in size. The feldspars include both plagioclase and orthoclase. The rounded quartz fragments here and there show narrow enlargements, and also the gradual fading away into the matrix which is characteristic of rocks where there is much of a finely fragmental matrix. It is possible that some of the induration has been produced by the independent secondary deposition of fine silica, but it seems to be largely due in this case to the chloritic alteration of the matrix. (Slide 1032.)

19. From the mainland, four to five miles east of Campement d'Ours Island Lake Huron. (Logan's "3 f," "Upper Slate Conglomerate.")

The specimens collected from the "Upper Slate Conglomerate," as exposed along the north shore of Lake Huron, between the French Islands and Campement d'Ours, are chiefly of rocks nearly allied to the last described, though including also some true vitreous quartzites, some of which have been above alluded to, and between which and the predominating graywackes there is a complete gradation. A part of the rock is very highly conglomeratic, with pebbles of granite, felsitic porphyry, and jasper, but in other portions the pebbles are wanting, or are very sparse and small. These present a great variation in coarseness, the finest kinds being contorted clay-slates, but they are all composed of essentially the same materials as noted in the slate conglomerate from the Palladreau Islands above described, like which they are all dark colored from the presence of much chlorite. Enlargements of the quartz fragments are generally to be made out, and, at least in those kinds which are more distinctly quartzitic, much of the induration is due to these enlargements. Induration seems also to have been produced by the deposition of a fine interstitial quartz, and a chalcedonic or amorphous silica. The feldspar grains, including both orthoclase and plagioclase, also often present an appearance which suggests that they too have been enlarged by second growths. Sharp lines of division between the supposed enlargements and the original nuclei, as seen so often in the case of enlarged quartz fragments, we did not satisfactorily make out; but in many instances the outer portion of the grain is relatively undecomposed and free from inclusions, as compared with the nuclei. This appearance, taken together with the fact that secondary enlargements of feldspar fragments have been proved to occur in certain Keweenaw sandstones, lead us to believe that we have them here also.<sup>17</sup> All of these rocks carry a very large amount of a green chloritic mineral, which has plainly been produced from the feldspars by a metasomatic process.

These graywackes are all typically "recomposed" rocks, and while plainly fragmental, are no more so than many kinds that are classed as crystalline schists. The enlargement of the quartz and feldspar grains, the production of abundant chlorite, the presence of much feldspar, and the secondary deposition of an interstitial silica certainly would have to be carried but little further to give us a rock in which it would be exceedingly difficult to detect the presence of the detrital material. (Slides 1215 to 1218.)

IN THE IRON-BEARING SERIES OF MARQUETTE, MICH.

A.—*Vitreous quartzites.*

20. Quartzite range, south of Marquette, near shore of Lake Superior, (N.W.  $\frac{1}{4}$ , Sec. 6, T. 47, R. 24 W., Michigan). (Brooks's "Formation V," "Lower Quartzite.")

A bright-red vitreous quartzite, composed almost wholly of interlocking areas of quartz, which are all taken to have been produced by the enlargement of fragmental

<sup>17</sup> See Part II of this bulletin; also American Journal Science, May, 1884, p. 399.

## 28 SECONDARY ENLARGEMENTS OF MINERAL FRAGMENTS. [BULL. 8.

nuclei, since in a number of them the outlines of these nuclei are plainly recognizable. The red color of the rock is due to the presence of a small quantity of red oxide of iron. (Slide 1009.)

### 21. Shore of Lake Superior, two and a half miles southeast of Marquette, (SE. $\frac{1}{4}$ , Sec. 36, T. 48, R. 25 W., Michigan). (Brooks's "Formation V," "Lower Quartzite."<sup>18</sup>)

This is the locality of the unconformable contact of the Lake Superior sandstone and Huronian quartzite, made classical by Foster and Whitney. A white, strongly vitreous quartzite. The induration appears to be almost wholly due to the interstitial deposition of fine quartz, the original outlines of the quartz fragments coinciding for the most part with the outlines as now seen of the individual areas. There is a little kaolinic interstitial material. (Slide 1013.)

### 22. Gannister quarries, north and south sides of Carp River, near Marquette (Secs. 35 and 36, T. 48, R. 25 W., Michigan.) (Brooks's "Formation V," "Lower Quartzite.")

Light-gray, highly translucent, completely vitrified quartzites. These rocks are composed almost wholly of quartz, there being a very minute quantity in some of the interstices of kaolinic material. Although coming from the same vicinity and layer as the rock last described, and not differing very much from it microscopically, we have in these rocks a case where the induration and vitrification are wholly due to secondary enlargement of the original fragments. The outlines of the nucleal grains are usually very distinct, and the enlargements interlock quite intricately, so that, as seen in the polarized light, this rock seems to be completely made up of originally deposited areas of quartz. In some portions the layers of the gannister quarries are quite thin-bedded. In sections from some of these thin-bedded portions in the quarries on the north side of Carp River the quartz areas are all elongated in a common direction, the lengths of the areas being usually great in proportion to their widths. These elongated grains of quartz interlock and overlap one another just as do the quartzes of many mica schists and gneisses. This arrangement in the present case is perhaps partly due to the pressing into this position of originally oblong areas, but it seems also to be due in part to the elongation of the quartzes by secondary enlargements. Fig. 1, Plate VI, represents a thin section of the non-schistose portion of this rock. (Slides 1012, 1479.)

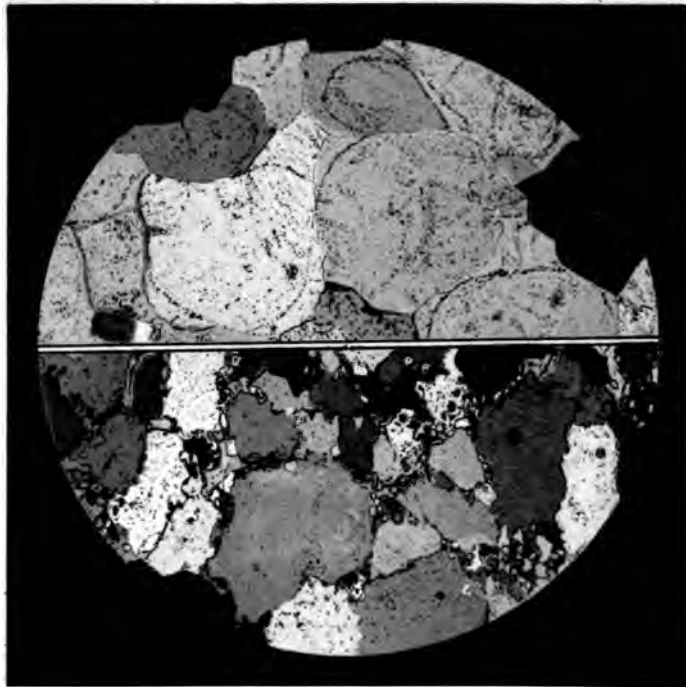
### 23. Northwest corner of Teal Lake, Michigan. (Brooks's "Formation V," "Lower Quartzite.")

A gray and brown vitreous quartzite. The same ledge shows also greenish, chloritic quartz-schists. In the sections of the non-schistose portions the induration is seen plainly to be the result of the interlocking of the enlargements of the original clastic particles, whose smoothly-rounded outlines are strongly marked. The cementing silica has, however, not all of it united with the original grains, some of it having separated out interstitially in minute interlocking areas. The peculiar appearance of gradation of a quartz area into fine interstitial quartz, due to the diminution outwards in power of the crystalline influence of the nucleal grain, is here noticed also. The more schistose portions of the rock of this ledge are seen in the thin section to carry a larger proportion of kaolin, and to have but little of the indurating silica co-ordinated with the original fragments, most of it having been deposited independently of them. (Slide 988.)

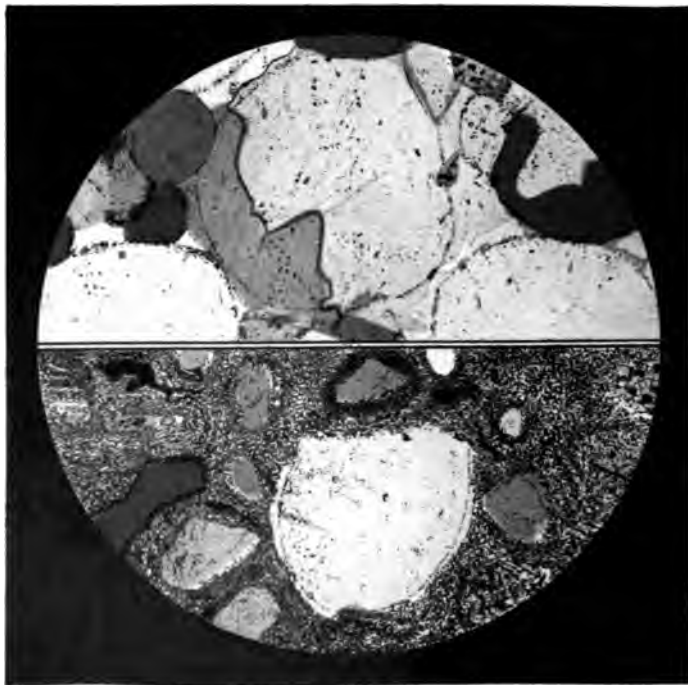
---

<sup>18</sup> Geol. Sur. of Mich., Vol. I, p. 83.





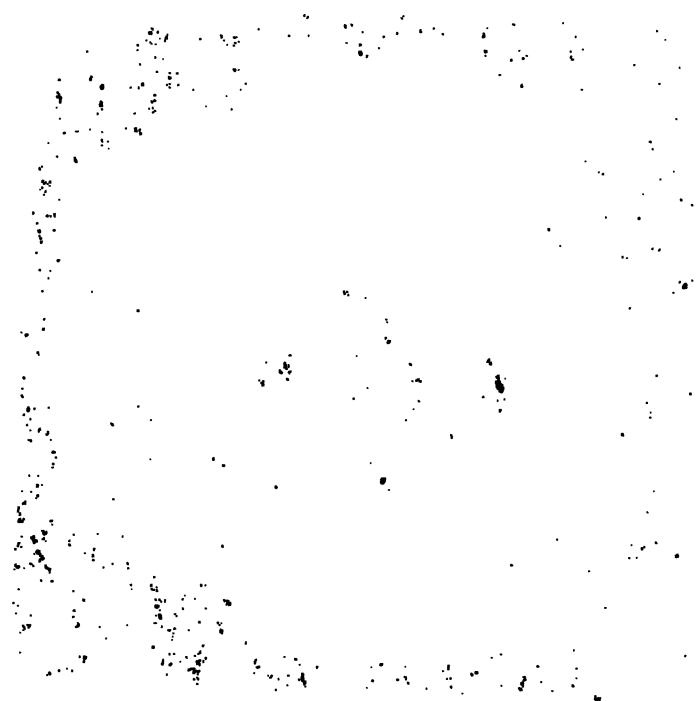
1



2

THIN SECTIONS OF QUARTZITES.





24. Hanging wall of Palmer Mine, Michigan. (Brooks's "Formation V," "Lower Quartzite.")

A dark-gray, conglomeratic quartzite. The numerous, large-sized quartz fragments of this rock, some of them simple, some of them complex, are buried in an abundant matrix, which is composed of finely-divided quartz mingled with amorphous or chalcedonic silica, the latter at times predominating, along with kaolinic material, flakes of muscovite and chlorite, and of oxide of iron. The quartz fragments are often angular, but there is no evidence that the angularity is due to secondary enlargements of rounded grains. The induration seems to be wholly due to the independently deposited interstitial silica. (Slide 973.)

25. Hanging wall, Saginaw Mine, Negaunee District, Michigan. (Brooks's "Formation XIV," "Upper Quartzite.")

A very dark-colored, conglomeratic quartzite, the pebbles partly of clear quartz and partly of red and black jaspery or cherty material. The rock is very much indurated, the induration being chiefly due to the independent deposition of interstitial quartz and of some amorphous silica, there being but few and small enlargements of the quartz fragments. Oxide of iron is very abundant in the matrix, which includes also some kaolinic material and muscovite scales. (Slide 1457.)

26. Hanging wall, Spurr Mine, Michigamme District, Michigan. (Brooks's "Formation XIV," "Upper Quartzite.")

A highly vitreous, dark-gray, conglomeratic quartzite, mostly made up of large, clear, often interlocking quartz areas, which are in many cases plainly, and inferentially always, due to the enlargement of fragments. A few biotite flakes, often altered into chlorite, as also particles of muscovite, microcline, and orthoclase, are contained. Within six feet across the strike this clear, vitreous quartzite passes into the chlorite schist, which carries the well-known chlorite pseudomorphs after garnet. There is a complete variation from one rock to the other within this distance. (Slide 1279.)

B.—*Quartz-schists.*

27. Quartzite range, south of Marquette, near shore of Lake Superior (N. W.  $\frac{1}{4}$ , Sec. 1, T. 47, R. 24 W., Michigan). (Brooks's "Formation V," "Lower Quartzite.")

A red, dolomitic quartz-schist. This rock grades within a few feet into the red, non-schistose quartzite described above as No. 20, and in another direction, within an equally short distance, into a clay slate, with strong transverse cleavage. The thin section shows quartz grains imbedded in a fine matrix. The quartz grains often show strongly marked secondary enlargements. The matrix contains some little kaolinic matter and some fine quartz, but appears to be chiefly made up of a finely crystalline dolomite, which is to be regarded as of a secondary nature. The red color is due to a minute quantity of iron oxide. (Slide 1007.)

28. North of Michigamme Mine (N. W.  $\frac{1}{4}$ , N. W.  $\frac{1}{4}$ , Sec. 20, T. 48, R. 30 W., Michigan). (Brooks's "Formation V," "Lower Quartzite.")

A dark- and light-banded quartz-schist, the light-colored bands being vitreous and quartzitic, the dark-colored ones being much finer and more clay-slate-like. There is a tendency to transverse cleavage, especially in the dark-colored bands. In the thin section the light-colored bands are seen to be composed mainly of worn grains of quartz, which have often been enlarged, and sometimes so much so as to interlock quite deeply. An interstitial material is present, composed of very fine quartz, with



### 30 SECONDARY ENLARGEMENTS OF MINERAL FRAGMENTS. [BULL. 8.]

biotite and kaolin scales, with a little chlorite and iron oxide. In sections of the dark-colored bands this matrix material becomes predominant. (Slides 1284, 1285, 1286.)

#### C.—*Mica-schists.*

#### 29. North of Michigamme Mine (N. W. $\frac{1}{4}$ , N. W. $\frac{1}{4}$ , Sec. 20, T. 48, R. 30 W. Michigan). (Brooks's "Formation V," "Lower Quartzite.")

A very fine-grained schist, strongly marked with very thin bands of sedimentary deposition, and exhibiting an imperfect slaty cleavage. Closely resembles much of the slate exposed along the Saint Louis and Mississippi Rivers, Minnesota, and grades into the rock last described, the only difference being that here the finer material predominates. In the thin section this resemblance is borne out, and the rock is seen to be composed as the matrix of No. 28. Some of the minute quartzes have distinctly been enlarged from fragmental particles. Crystals of garnet occur very sparsely scattered through the section. It is difficult to say how much of the fine quartz of this rock is the result of crystallization *in situ*, and how far the result of the enlargement of fragments. (Slide 1289.)

#### D.—*Sandstone.*

#### 30. Short distance north of the foot-wall of Spurr Mine, Michigamme, District, Michigan. (Brooks's "Formation XII.")

A fine-grained, saccharoidal, very friable, white sandstone, the grains being provided with crystal faces. Certain bands, one-eighth to one-fourth of an inch wide, carry much magnetite. The sand crumbled from the rock by hand shows, in a balsam mounting, that each one of the faceted grains has a rounded fragment as a nucleus. It is only with a particular disposition of the light that the outlines of the original grains can be detected, so clear are both the nuclei and the enlargements. The crystal terminations are generally both present. See Fig. 3, Plate II. (Slides 1274, 1433, 1434.)

### FROM THE IRON-BEARING SERIES OF THE PENOKEE REGION, WISCONSIN.

#### A.—*Vitreous quartzites.*

#### 31. Near Penokee Gap, Ashland County, (N. W. $\frac{1}{4}$ , Sec. 14, T. 44, R. 3 W., Wisconsin.) ("Formation III" of the Penokee series, "Siliceous Schist.")<sup>19</sup>

A greenish, vitreous quartzite, composed almost wholly of intricately interlocking quartz areas of some size, each one of which has, however, plainly been enlarged from a fragmental nucleus. Chlorite in small particles forms the only other ingredient. (Slide 1402.)

#### 32. Gorge of Tyler's Fork, Ashland County (S.E. $\frac{1}{4}$ , N.E. $\frac{1}{4}$ , Sec. 33, T. 45, R. 1 W., Wisconsin). ("Formation III.")

A greenish, vitreous quartzite, closely like the rock last described, except that the induration, though chiefly, is not wholly due to the enlargement of the original fragments, there being present quite a quantity of a finely divided interstitial quartz. The chlorite, besides occurring in bunches, is noticed also to occur in films around the outlines of the nucleal grains of the quartz areas. (Slide 2094, Wisconsin survey series.)

<sup>19</sup>For the stratigraphy of the Penokee series, and the numbers given to its subordinate members by R. D. Irving, see Geol. of Wis., Vol. III, p. 104. For a description of Formation III throughout its extent, see the same, pp. 111-118.

33. Bad River, Ashland County (S.W.  $\frac{1}{4}$ , N.W.  $\frac{1}{4}$ , Sec. 11, T. 44, R. 3 W., Wisconsin). ("Formation XV."<sup>20</sup>)

A very dark-gray feldspathic quartzite, composed of angular quartz and partly kaolinized feldspar fragments (the former often slightly enlarged) imbedded in an abundant matrix composed largely of the same materials, with a good deal of a blackish iron oxide in fine particles. As is usual where there is much of a fine fragmental or clayey matrix, the quartz fragments appear to merge into the matrix. (Slide 1496, Wis. sur. series.)

34. Near Penokee Gap (west line N.W.  $\frac{1}{4}$ , Sec. 11, T. 44, R. 3 W., Wisconsin). ("Formation XIX."<sup>21</sup>)

A very fine-grained, dense, black, vitreous quartzite. Quartz in minute particles is the most abundant ingredient. Much of it appears clearly to be of a clastic origin, and the grains have often received secondary enlargements. Biotite in abundant, minute, brown scales; fragments of feldspar, pyrite, and brown iron oxide are the remaining ingredients. (Slide 1113.)

#### B.—*Quartz-schists.*

35. The gorge of Tyler's Fork, Ashland County (N.E.  $\frac{1}{4}$ , Sec. 33, T. 45, R. 1 W., Wisconsin). ("Formation III.")

A greenish-gray, vitreous quartzite, very clearly resembling No. 28 of this list. Quartz, in relatively large, interlocking areas, composes fully three-fourths of the section, each area having a distinctly marked, nucleal fragment. The enlargements of these fragments are often unusually wide, and the interlocking at times quite intricate. A little, finely-divided quartz is present in the interstices. Chlorite occurs in large rounded areas, which are taken to have resulted from the decomposition of feldspar fragments in films and patches between the quartz areas, and in films following the outlines of the original grains, thus taking the place more usually occupied by iron oxide, which is, however, also present to some extent here. (Slide 1111.)

36. South line Sec. 27, T. 45, R. 2 W., Ashland County, Wisconsin. ("Formation XXI."<sup>22</sup>)

A light-gray, fine-grained quartz-schist. Rather sparsely scattered fragments of quartz and feldspar, the former the most abundant, are scattered through a matrix composed of the same materials, with more or less kaolin, muscovite, chlorite, and iron oxide, in fine particles. The quartz fragments are often distinctly enlarged. (Slide 1113.)

#### C.—*Mica-schist.*

37. West line S.W.  $\frac{1}{4}$ , Sec. 2, T. 44, R. 3 W., Ashland County, Wisconsin. ("Formation XXI," the great mica-schist at the top of the series.)

A light-gray, very fine-grained, quartzose mica-schist. Quartz in closely fitting areas, in many of which a nucleal fragment may be recognized, is the chief constituent. There is also some fragmental orthoclase. The mica (biotite) lies between the quartz areas, and along with it there is often some brown oxide of iron. (Slide 2006, Wis. sur. series.)

---

<sup>20</sup> Geol. Wis., Vol. III, p. 142.

<sup>21</sup> Geol. Wis., Vol. III, p. 144.

<sup>22</sup> Geol. Wis., Vol. III, pp. 145-149.

D.—*Graywacke and graywacke-slate.*

38. Tyler's Fork (N.E.  $\frac{1}{4}$ , Sec. 28, T. 45, R. 1 W., Ashland County, Wisconsin). ("Formation XVII."<sup>23</sup>)

A very dark-gray, fine-grained rock, similar macroscopically and microscopically to No. 33 of this list, differing only in the larger proportion of the feldspathic and clayey material. Many of the quartz grains are distinctly enlarged, and present the common appearance of merging into the matrix. The decomposed feldspar fragments have about them often borders of a fresh feldspathic material, an occurrence suggesting that they too have received secondary enlargements. (Slide 2104, Wis. sur. series.)

E.—*Arenaceous quartzite and sandstone.*

39. Penokee Gap, Ashland County, Wisconsin, (N.E.  $\frac{1}{4}$ , N.W.  $\frac{1}{4}$ , Sec. 14, T. 44, R. 3 W., Wisconsin). ("Formation II."<sup>24</sup>)

A milky-white, arenaceous or semi-vitrified quartzite. Except some few minute particles of brown oxide of iron, the slide shows nothing but quartz in closely fitting, sometimes interlocking areas, within many of which may be seen the outlines of the nuclear fragments. The slide is evidently from one of the more vitrified portions, the rock being quite irregular in the degree of induration. (Slide 1110.)

40. Mount Whittlesey, Ashland County (N.W.  $\frac{1}{4}$ , N.W.  $\frac{1}{4}$ , Sec. 16, T. 44, R. 2 W., Wisconsin). ("Formation II.")

A very fine-grained, white, indurated sandstone, closely like the last rock described, except that the enlargements of the grains are very frequently furnished with crystal faces, as may be seen both in the thin section and in the balsam mounting of sand crumbled from the rock. This is evidently a common peculiarity of this layer in the Penokee series, since hand specimens from different localities are made up of sparkling grains. There is often a very abrupt transition from the highly arenaceous to the strongly vitrified phase. (Slides 1406, 1465, 1482.)

## IN THE SLATES OF THE SAINT LOUIS RIVER, MINNESOTA.

41. Knife Falls, Saint Louis River, Minnesota.

A fine-grained, light-gray, highly argillaceous schist. Minute fragments of quartz, orthoclase, and oligoclase, the first-named often with small enlargements, are buried in a fine matrix, composed partly of the same materials and partly of kaolin, with some chlorite.

42. Near Mahtowah, Minnesota.

An arenaceous schist, closely resembling the last described, both macroscopically and microscopically, except that it is somewhat coarser grained. The quartz fragments are often enlarged. (Slide 766.)

43. Saint Louis River, near Thompson, Minnesota.

A very dark-gray, fine-grained graywacke. The thin section shows the rock to be composed much like the last two described, except in containing a larger quantity of feldspar fragments, and in having a larger proportion of chlorite in the matrix. The quartz fragments are often distinctly enlarged.

These rocks are all somewhat nearly allied to the graywacke-slates of Lake Huron. They are, however, whilst fine-grained, only the coarser phases of the great slate formation in which they occur, the predominating phases of which are true-clay slates

<sup>23</sup> Geol. Wis., Vol. III, p. 142.

<sup>24</sup> Geol. Wis., Vol. III, p. 108.

and a very fine-grained, shining mica-slate, in which the proportion of decomposed feldspar detritus is often very large, and the quartz fragments are so minute that if any secondary enlargements occur they are very difficult of detection. The whole series is affected by a very strong transverse cleavage, the fine bands of sedimentary lamination being at the same time often most beautifully preserved. (Slide 761.)

#### IN THE QUARTZITE FORMATION OF THE BARABOO REGION OF WISCONSIN.

##### A.—*Vitreous quartzites.*

#### 44. Caledonia, Columbia County, Wisconsin.

A grayish-white quartzite conglomerate, the pebbles being of white quartz and of small size. In the thin section quartz fragments of some size, often showing distinctly secondary enlargements, are buried in a finer matrix, chiefly of the same material, some of which may be fragmental, but much of which appears to be originally deposited material. (Slide 729.)

#### 45. Upper Narrows of the Baraboo River, Sauk County, Wisconsin.

Dark purple, vitreous, close-granular quartzite, made up almost wholly of interlocking areas of quartz, each one of which has been produced by the enlargement of a fragmental nucleus whose outline is always strongly marked by oxide of iron. The lines along which the interlocking areas of quartz join are peculiarly jagged. There is also present some of a fine, independently deposited interstitial quartz. (Slide 745.)

#### 46. Freedom, Sauk County, Wisconsin.

A pinkish white, very close-grained, vitreous, translucent quartzite. The thin section is made up entirely of irregularly outlined, interlocking, angular areas of quartz, all of which have evidently been formed by the enlargement of fragmental nuclei, the outlines of which, however, are usually very faintly marked. While plainly composed in the main of detrital material, this rock, but for the discovery that these enlargements exist in other quartzites, would undoubtedly be taken as made up entirely of quartz crystallized *in situ*. (Slide 744.)

#### 47. Westfield, Sauk County, Wisconsin.

A pinkish, vitreous, translucent quartzite, composed chiefly of interlocking quartz areas, the outlines of the original fragments being generally very distinctly marked. The enlargements are usually not broad. There is a small quantity of fine interstitial quartz which appears to have been deposited *in situ*.

##### B.—*Quartz-schists.*

#### 48. Lower Narrows of the Baraboo River, Sauk County, Wisconsin.

A yellowish-white, granular, argillaceous quartz-schist, composed in about equal proportions of a fine clayey matrix, and of rounded fragments of quartz with some of feldspar. The matrix includes also some fine quartz. The quartz fragments show the usual small enlargements and appearance of fading into the matrix, so often noted above as characteristic of clayey quartzites. (Slide 735.)

#### 49. Ableman's, Sauk County, Wisconsin.

A dark-grayish, vitreous quartz-schist, made up chiefly of enlarged quartz grains, elongated in a common direction, whence the schistose structure. There is a minor quantity of fine interstitial quartz. (Slide 748.)

#### 50. Upper Narrows of the Baraboo River, Sauk County, Wisconsin.

Pink, fine-grained, quartz-schist, made up chiefly of grains of quartz, with their longer axes lying in a common direction, each enlarged from a nucleal fragment.

(217)

One fourth of the rock is made up of fine filling material, which is about equal parts of fine quartz and kaolin (Silica 740). It has a gray color and is quite regular in color and texture. The rock is a good example of a sandstone.

51. Devil's Lake, Sauk County, Wisconsin.

The larger portion of the quartzite in the Devil's Lake region is without arenaceous appearance, but now and then a tendency to an arenaceous appearance is notable, and occasionally small areas are met with where the rock is only a slightly indurated or even a quite loose sandstone. The transition from these sandstones to the most indurated quartzite is quite abrupt. The present slides consist of a balance mounting pulverized from one of the slightly indurated portions. Each rolled grain of sand is seen to be surrounded by a secondary border of limpid quartz, on which, however, crystal faces are not to be observed, the interferences having been too great. (Slides 820, 821.)

IN THE QUARTZITE FORMATION OF SOUTHERN MINNESOTA

### A. — Vitreous quartzites

## 52. Redstone, Nicollet County, Minnesota.

In southwestern Minnesota, and westward in Southeastern Dakota, as far as the James River Valley, are areas of a sandstone and quartzite formation, which evidently underlies all of this region, the exposures being detached from one another by the overlying Cretaceous and Quaternary formations. Unfortunately, the next newer formation with which it is seen in contact is the Cretaceous, so that stratigraphical proofs of its geological position are wanting. It is contrasted so completely with the Potsdam formation of the Mississippi Valley, that there can be no question of its inferior position. So far all who have examined it of late years are agreed. Professor Winchell, if he is rightly understood by us, is disposed to regard it as the equivalent of the lower portions of the copper-bearing series. Certain of the reddish, more argillaceous, and more sandy parts of the formation are often much like some of the red sandstones of the copper series, although the similarity does not hold on closer inspection. In its quartzitic portions the formation is almost identical in character with the Huronian quartzites of the Baraboo region of Wisconsin. In its more argillaceous portions, also, it approaches very nearly the argillaceous members of the series of the Peweesee region, and the pipestone-bearing quartzites of Barron County, Wisconsin. These resemblances, the evident considerable thickness of the series, and the differences between it and the Keweenaw rocks leave little doubt in our minds of the correctness of the position taken by those who would refer it to the Huronian. It may be said that much of the quartzite of this region is near to much of the quartzite of the Huronian of Lake Huron.

At Redstone the transitions from argillaceous, micaceous sandstone to completely vitrified, dark red to purple quartzites, and from these again to completely indurated sandstones, are frequent and abrupt. In places, over considerable areas, the uppermost is half the rock at higher levels and the overlying is composed of a hard, indurated quartzite cutting it is seen that the vitreous quartzites are not restricted to the exposed portions, but are interstratified with, and arranged in irregular areas in, an entirely unindurated crumbling sandstone. The peculiarly irregular distribution of the induration; and the abrupt transitions from indurated to non-indurated material, suggest the possibility of its production by the descent along joints and the spreading thereof through the layers of a silica-bearing solution. The thin sections of the completely vitrified quartzites of this place show the outlines of the original fragmental grains, strongly marked by borders of oxide of iron. In the main the fragments are simple, but at times they are composed each of several interlocking quartz areas. All of

these fragments have been enlarged, the simple beds in the original mass have been broken up into larger complex areas. The enlargements at times interlock, but in other portions of the sections interstices are left between them, which have been filled by an independently deposited silica, a portion of which is chalcedonic or amorphous. (Slide 1376.)

### 53. Near New Ulm, Nicollet County, Minnesota.

A fine conglomerate, forming the matrix of a boulder, conglomerate composed of white quartz pebbles, imbedded in a still finer matrix of fine quartz, kaolin, and oxide of iron. The quartz fragments were in the main originally complex, but have been slightly enlarged. (Slide 1373.)

### 54. Delton, Cottonwood County, Minnesota.

A pinkish, glassy quartzite. The thin sections show essentially the same characters as No. 53 of this list. Some of the interstitial material of these rocks is not only quartz, but also silica arranged radially about some of the complex grains of quartz. (Slides 1380, 1381, 1382.)

### 55. Mound Creek, Germantown, Cottonwood County, Minnesota.

An arenaceous, gray quartzite. The thin sections resemble those of the immediately preceding numbers, except that the induration has not proceeded so far, the enlarged masses of the grains not having commonly interlocked. There is much of a fine quartzose matrix. (Slide 1383.)

## B. Sandstone.

### 56. Redstone, Nicollet County, Minnesota.

A fine-grained, somewhat indurated, red, argillaceous sandstone. Fragments of quartz, partly simple, partly finely complex, the former often enlarged, are imbedded in a matrix of red iron oxide, clayey material and fine quartz. (Slide 1375.)

### 57. Redstone, Nicollet County, Minnesota.

One end of the specimen is a purple vitreous quartzite like No. 56; the other a loose sandstone, with the grains faceted from secondary enlargement. We have, then, in this specimen the two extremes of the process of induration. (Slides 1377, 1378.)

## IN THE ANIMIKIE SERIES OF NORTHERN MINNESOTA AND THE THUNDER BAY REGION OF LAKE SUPERIOR.

### A.—Vitreous quartzites.

### 58. Prairie River Falls, (Sec. 34, T. 56, R. 25 W., Minnesota).

A highly vitreous quartzite, closely resembling much of the red quartzites of the Minnesota (e.g., Sec. 64 of this list), also the red quartzites bearing the name of the quartzite (e.g., No. 20) and Baraboo Minnesian regions (e.g., No. 20). The induration has been almost entirely produced by the enlargements of very much rounded fragments, which outlines are beautifully marked in the thin section by lines of red and brown oxide of iron. The enlargements have often very intricately interlocked. In the needles are plentiful in the original fragments, coming up often quite to their outlines, but are altogether absent from the enlargements. There is no other mineral of importance present. The quartz fragments are usually simple, but are occasionally made up of two or more interlocking quartz areas. Figs. 1 and 2, Plate IV, magnified 33 diameters, represent portions of this rock in the ordinary and polarized lights, so that the present and original outlines of the quartz areas may be readily seen. (See also Fig. 12, Plate VI., upper half. (Slides 1088, 1089.)

## 59. Wauswangoning Bay, Lake Superior, Minnesota.

A light-gray, vitreous quartzite. Angular quartz areas, each plainly enlarged from a nucleal grain, and often interlocking, make up most of the rock. There are also present fragments of feldspar and fragments made up of very minute interlocking quartz areas. Chlorite is present in the matrix, which appears to be in part composed of quartz deposited *in situ*. (Slide 413.)

## 60. Pigeon Point, Lake Superior, Minnesota.

A very dark-gray, nearly black, compact, very fine-grained, vitreous quartzite. Consists of angular quartz areas, plainly enlarged from fragmental nuclei, whose outlines are often visible, with some fragments of feldspar (both orthoclase and plagioclase), imbedded in a matrix made up of minute interlocking quartz areas, chlorite and biotite flakes and abundant small round grains of a brightly polarizing, colorless mineral, which is nearer in appearance to the sahlite variety of augite than to anything else with which we are familiar. This rock is very near to those described as vitreous graywackes, the only difference being in its greater richness in quartz, and highly vitreous character. It is also very close, indeed, to the more quartzitic phases of the "slate-conglomerates" of Lake Huron, and is quite as completely a "crystalline" rock as anything except the greenstones to be found in the type Huronian of Lake Huron. It is a type of rock which is largely concerned in the make-up of the Animikie series. It is directly interstratified with arenaceous quartzites or even sandstones. (Slide 423.)

B.—*Arenaceous quartzites.*

## 61. Portage Bay Island, Minnesota, coast of Lake Superior.

The light-gray, fine-grained arenaceous rock of Portage Bay Island is often little more than a slightly indurated sandstone, but in places it becomes a decided quartzite, and though always somewhat more arenaceous, gives sections which resemble very closely those of No. 59 of this list, the induration being merely not quite so strong. The outlines of the original fragments are beautifully distinct, and the enlargements are very broad. There is some calcite present in the matrix. (See Fig. 2, Plate III.) (Slides 402, 403.)

C.—*Vitreous graywackes.*61. South side of Rove Lake, Minnesota (N.E.  $\frac{1}{4}$ , Sec. 28, T. 65, R. 1 E. Minnesota).

A fine-grained, dark-gray, much indurated rock, with conchoidal fracture. This rock differs from No. 60 in its larger content of feldspathic and chloritic material. It may be taken as the type of the rock which forms the larger part of the Animikie series. The quartz is the principal mineral and occurs in three phases: (1) in simple fragmental grains, always showing some secondary enlargements; (2) in complex fragments, which are also occasionally enlarged; (3) as an interstitial material in minute interlocking areas. The feldspar fragments include orthoclase and plagioclase, and are very plentiful, often closely interlocking with the enlarged quartzes. Some kaolinic material in the matrix probably represents decomposed feldspars. Some chlorite is also present in the matrix. The rock is fully as "crystalline" as anything in the original Huronian, to the graywacke-slates of which it is closely comparable, especially to the more quartzitic phases of those rocks. It is still closer to some of the quartzitic phases of the slate series of the Saint Louis River (*e.g.*, No. 43) and of the great series of folded schists of the Knife and Kingfisher Lake region on the national boundary. (Slides 1346, 1347.)

63. East end of Mountain Lake (S.W.  $\frac{1}{4}$ , S.W.  $\frac{1}{4}$ , Sec. 13, T. 65, R. 2 E., Minnesota.)

A lighter-colored rock than No. 62, but otherwise identical with it. (Slide 1350.)

64. Partridge Falls, Pigeon River, Minnesota.

A feldspathic quartzite or vitreous graywacke, very close to No. 62, differing only in having less interstitial material, and, consequently, more thorough interlocking of the enlarged quartz areas with each other, and with the feldspar particles. (Slides 1181, 1328.)

65. South side of Clear Water Lake (near center of Sec. 27, T. 65, R. 1 E., Minnesota.)

Differs from No. 62 only in being finer grained, being otherwise identical with it, macroscopically and microscopically. (Slide 1178.)

66. East side of Thunder Bay, Canada.

A dark-gray rock, near to No. 62, except that it is finer grained and is more argillaceous. The thin section shows a larger quantity of kaolinic interstitial material than No. 62, and a larger proportion of chlorite. The usual enlargements of the quartz fragments are found. (Slide 432.)

D.—*Argillaceous graywacke.*

67. Grand Portage Falls, Pigeon River, Minnesota.

A fine-grained, light-greenish-gray, argillaceous, not greatly indurated rock. The thin section is near to that of No. 62, but shows a very much larger amount of a clayey matrix, and less of a siliceous cement. The quartz fragments are often enlarged. (Slide 1355.)

IN THE FOLDED SCHIST OF THE NATIONAL BOUNDARY LINE, NORTH OF LAKE SUPERIOR.

68. Kingfisher Lake (S.W.  $\frac{1}{4}$ , S.E.  $\frac{1}{4}$ , Sec. 23, T. 65, R. 6 W., Minnesota.)

A dark-gray, fine-grained, vitreous graywacke or quartzite, somewhat coarser grained than No. 62 of this series, but otherwise closely like it. This resemblance holds also in the thin section, except that this rock is, perhaps, somewhat more feldspathic. The quartz fragments are often enlarged. (Slide 1147.)

69. Kingfisher Lake (N.W.  $\frac{1}{4}$ , N. E.  $\frac{1}{4}$ , Sec. 26, T. 65, R. 6 W., Minnesota.)

A dark-gray, fine-grained rock, resembling the last described, but somewhat coarser-grained. Close also to much of the graywacke of the slate-conglomerate of Lake Huron. In the thin section, quartz and feldspar fragments, the former often enlarged, and the latter including both orthoclase and plagioclase, are embedded in fine matrix composed partly of quartz, but also in part of amorphous silica and kaolin, with also numerous particles of oxide of iron. Chlorite is abundant as an alteration-product of the feldspars. (Slide 1144.)

70. Knife Lake (N. W.  $\frac{1}{4}$ , S. E.  $\frac{1}{4}$ , Sec. 17, T. 65, R. 6 W., Minnesota.)

A fine-grained, dark-gray cherty quartzite or quartz-schist. The fragments of quartz are often enlarged. Orthoclase and plagioclase compose about one-half of the rock, the remainder being made up of an excessively fine, siliceous matrix material, which, in a large measure, has no effect on the polarized light.

It is of considerable interest as bearing upon the question of the structural relation



## 88 SECONDARY ENLARGEMENTS OF MINERAL FRAGMENTS

of the peaks of the great alate series, from which these specimens come, to the Animikie series south of them, that there should be such a close lithological resemblance between the rocks of the two series.<sup>25</sup> (Slide 1151.)

### KEWEENAW SANDSTONES

#### 71. Eagle Harbor, Keweenaw Point, Michigan.

A red sandstone from the uppermost part of the "great conglomerate." This rock, which is made up of the detritus of different acid porphyries, is described in detail in the second part of this bulletin, since the induration has been mainly due to the secondary enlargement of feldspar fragments. The few grains of quartz contained and observed at times to have received secondary enlargements. (Slides 509, 547.)

#### 72. Near Copper Falls Mine, Keweenaw Point, Michigan.

A red sandstone from a layer interstratified with amygdaloids and traps, much resembling No. 71, except that the principal indurating material is calcite. The occasional quartz grains show very distinct enlargements.<sup>26</sup> (Slide 526.)

#### 73. North side Portage Lake (Nonesuch Belt?), Keweenaw Point, Michigan.

A fine-grained, dark-colored, strongly-indurated sandstone, composed in large part of the detritus of the acid porphyries and basic rocks of the Keweenaw series, but containing also a large proportion of quartz fragments, most of which show distinct secondary enlargements.<sup>27</sup> (Slide 614.)

#### 74. Foot-wall of the Nonesuch Mine, Porcupine Mountains, Michigan.

A high-red, brown, streaked, fine-grained sandstone, composed about two-thirds of fragments of basic and acid eruptives, the remainder being quartz fragments, many of which are quite angular, and seemed to have broken from the crystals of a quartz-porphry. In many cases these fragments have received secondary enlargements.<sup>28</sup> (Slide 617.)

#### 75. Little Iron River, (N. W. $\frac{1}{4}$ , N. W. $\frac{1}{4}$ , Sec. 12, T. 50, R. 43 W., Michigan).

A fine-grained, dark gray, much indurated sandstone or graywacke, the silver-bearing rock of Iron River. The predominant quartz occurs in the two forms of interlocking areas of some size, each with a plainly fragmental nucleus, and of an independently deposited interstitial material. The quartz fragments are at times finely crystalline. The remainder of the rock is made up of quartz-porphry detritus, with some infiltrated calcite. (Slide 620.)

#### 76. Little Iron River, (S. W. $\frac{1}{4}$ , Sec. 13, T. 51, R. 42 W., Michigan).

A rock close to the last described and coming from the same silver belt, differing chiefly in having more infiltrated calcite in the matrix. The induration is, however, largely due to infiltrated quartz, which occurs both as enlargements to the quartz fragments and independently oriented.

The rocks from the same belt on Big Iron River, on the lake shore near Lone Rock;

<sup>25</sup> Monographs of the U. S. Geological Survey, Vol. V, pp. 399, 417.

<sup>26</sup> For description and figures of this rock, see monograph on Copper-bearing rocks of Lake Superior, pp. 129, and Plate XVI, Fig. 3, here reprinted. (Geological Survey of the U. S., pp. 103, 120-121.)

<sup>27</sup> For further description of this rock, see *Loc. cit.* p. 131, on and between pages 131 and 132, pp. 121, 122, and to which are all more fully described in the monograph on the same subject.

and in the vicinity of Presque Isle River, except that the main detrital sand is detrital calcite become more abundant, present the same appearance. (Slide 355.)

77. Presque Isle River, (N.H. 14, sec. 15, Twp. 49, R. 45, Mich. 14, Michigan).

Upper sandstones of the Keweenaw series. A dark-red, fine-grained sandstone, closely similar to the last two described. The quartz fragments are both simple and complex, the first often widely enlarged. (Slide 355.)

78. Silver Islet Landing, north shore of Lake Superior, Canada.

A fine-grained, open-pored, indurated sandstone. Angular, often interlocking quartz areas, each with a fragmental nucleus plainly outlined, make up most of the rock. Independently deposited quartz and some admixtures occur interstitially. (Slide 471, 472.)

79. East side of Black Bay, Lake Superior, Canada.

A fine-grained, red-and-white-streaked, quite indurated, sandstone. Subangular fragments of quartz, often showing quite wide and distinct enlargements, along with feldspar fragments, are bedded in a matrix of finer fragmental quartz, which, in the bedded areas, is mingled with dark oxide of iron, and, in the white ones, with dolomite. (Slide 473.)

80. Burat Island, Nipigon Bay, Lake Superior.

A fine-grained, brick-red, very much indurated sandstone, almost a quartzite. The predominating quartz is in interlocking areas each with a distinctly outlined fragmental nucleus. These fragments have at times been very wide and also in the shape of thin independently deposited and bedded material. The feldspar fragments are plenty, and the rock is stained with oxide of iron. (Slide 474.)

81. The Grand Canyon of the Colorado, near the mouth of the Little Colorado River, Arizona.

The specimens from this locality, kindly furnished to me by Mr. Walcott, of the U. S. Geological Survey, range from a moderately indurated sandstone to nearly wholly crystalline quartzite. They are mostly white, but for a considerable distance of quartz with a minute quantity of brown oxide. The outlines of the original fragments are everywhere distinct, but always lie some distance within the individual areas, which interlock more or less thoroughly. (Slides 1853-1860 inclusive.)

82. Immediately above unconformable contact with Huronian iron ores, Cyclops and Norway mines, Menominee iron region, Michigan.

A very much indurated, buff to brown sandstone, at times almost a quartzite. The thin section is composed almost entirely of interlocking grains of quartz, each with its distinctly outlined fragmental core. There is a little independently deposited interstitial quartz, and a little fragmental feldspar. The rock is in no respect different from such that is to be seen among the quartzites of the Huronian. (Slide 360, 361.)

83. The description of this rock see Op. cit., p. 139.

84. The description of this rock see Op. cit., p. 139.

85. The description of this rock see Op. cit., p. 139.

86. The description of this rock see Op. cit., p. 139.

87. The description of this rock see Op. cit., p. 139.

88. The description of this rock see Op. cit., p. 139.

89. The description of this rock see Op. cit., p. 139.

90. The description of this rock see Op. cit., p. 139.

91. The description of this rock see Op. cit., p. 139.

92. The description of this rock see Op. cit., p. 139.

93. The description of this rock see Op. cit., p. 139.

94. The description of this rock see Op. cit., p. 139.

95. The description of this rock see Op. cit., p. 139.

96. The description of this rock see Op. cit., p. 139.

97. The description of this rock see Op. cit., p. 139.

98. The description of this rock see Op. cit., p. 139.

99. The description of this rock see Op. cit., p. 139.

100. The description of this rock see Op. cit., p. 139.

#### 40 SECONDARY ENLARGEMENTS OF MINERAL FRAGMENTS. (BULL. 8.)

##### 83. Lower Narrows of Baraboo River, from near contact with Archaean quartzite.

A much indurated, fine-grained sandstone carrying quartzite pebbles. The quartz fragments, originally but little rounded, are all strongly enlarged, so that there is a considerable degree of interlocking. There is also present some fine independently deposited interstitial quartz. The section does not differ materially from those of many Archaean quartzites. (Slide 742.)

##### 84. Roche Écrite, Adams County, Wisconsin.

A dark-purplish, in places very much indurated sandstone. The grains are all enlarged, and occasionally have crystal faces developed. (Slide 749.)

##### 85. Packwaukee, Marquette County, Wisconsin.

A pale, buff-colored, much indurated sandstone, showing only very rare crystalline facets. In the thin section the grains are seen to have been enlarged slightly, so as to fit closely without any dovetailing. Occasionally the enlargements have had an opportunity to develop crystal faces. (Slides 731, 732.)

##### 86. Black River Falls, Jackson County, Wisconsin.

A white, rather coarse-grained rock, not so much indurated as the last-described, and showing more crystal facets, although not very plentifully. The thin section is much like that of the rock last described, except that the enlargements are proportionally broader and have more often developed crystal faces. (Slides 733, 734.)

##### 87. New Lisbon, Wisconsin.

A fine-grained, pink-and-white-mottled sandstone, from which the light is reflected in numerous sparkling points. The induration, while distinct, is only slight, small fragments crumbling readily in the fingers. The crumbled sand mounted in balsam shows every grain enlarged, the lines of junction between the old and new quartz being always strongly marked. The enlargements have in all cases developed crystalline faces, which are, however, only perfect and uninterrupted upon the smallest of the grains. In most cases they are more or less indented by the enlargements of contiguous grains. This rock may be taken as a type of the crystal-faceted sandstones. (Slides 710 to 716 inclusive.) (See Figs. 4, 5, 6, Plate II.)

##### 88. Middleton, Dane County, Wisconsin.

A fine-grained, loose, white sandstone, showing the grains sparkling from crystal facets. The balsam mounting of the sand crumbled from the rock shows the grains with the usual cores and crystal outlines. (Slides 1469, 1470.)

#### IN THE EASTERN SANDSTONE OF LAKE SUPERIOR.

##### 89. West Branch of the Ontonagon River (Sec. 13, T. 46, R. 41 W., Michigan).

A reddish, coarse-grained, indurated sandstone. The quartz fragments which make up the rock have all been enlarged, sometimes very much so, so as to interlock. There is also some independently oriented fine interstitial quartz. Some much reddened, feldspathic detritus is included. (Slides 95, 96, 97.)

##### 90. Quarry on Torch Lake Railroad, Keweenaw Point, Michigan.

A white to pinkish, feebly indurated quartzose sandstone. Some of the less indurated portions show numbers of faceted grains. The slide here described is from one of these less indurated portions. It is seen to be made up almost entirely of much rolled quartz fragments, which have in nearly every instance been enlarged, the enlargements only occasionally showing crystalline outlines. These crystal outlines

are, however, more frequently to be seen in the balsam mounting of crumbled sand. They are not nearly so numerous, however, as in some of the rocks previously described, the grains having interfered too much to form crystal outlines. The outlines of the original grains are usually very strongly marked by brownish iron oxide. There are occasional rounded fragments of feldspar present, and in each thin section may be seen a few particles worn from some of the fine-grained Keweenaw eruptives. (See Figs. 7, 8, 9, Plate II.) (Slides 513, 514, 1471, 1472, 1473.)

See with regard to this rock also Copper-Bearing rocks of Lake Superior, pp. 356-358. See also for an earlier description M. E. Wadsworth in *Bull. Mus. Comp. Zool.*, Vol. VII, No. 1, p. 117. Wadsworth found the crystal-outlined grains abundantly in his sections, although we failed to do so in ours until recently. He regarded these crystal grains as being the usual dihexahedral crystals of quartz-porphyrines, on which view the crystals antedate the formation of the sandstone instead of being subsequent to it. More recently (*Science*, Vol. II, No. 23, p. 52, July 13, 1883) he has reasserted this view. But a careful re-examination of this rock, as also of others from other places within the area of the Lake Superior sandstone, has served to convince us that in all of these cases, as in all sandstones yet examined by us, provided with such faceted grains, they owe their crystal faces to secondary enlargements of rolled fragments. It is of course possible and even probable that these quartz fragments were once, some of them, the quartzes of quartz porphyries, but if so they have rarely, if ever, retained their crystal faces, as it is, indeed, hardly conceivable that they should do.

#### 91. Quarries at Marquette, Mich.

A reddish, fine-grained sandstone, showing numerous minute glistening flakes of mica. Quartz fragments make up rather more than half of the rock, many of the grains being finely complex. The simple quartz grains are mostly very angular; many of them show very distinct enlargements. The remainder of the rock is composed chiefly of fragments of feldspar, including orthoclase and plagioclase, with chlorite, brown iron oxide, and muscovite flakes, the chlorite having resulted from the alteration of the feldspars. The plagioclase includes quite a number of large-sized pieces of microcline.

#### 92. Near Rockland. South of the Trap Range (S. E. $\frac{1}{4}$ , Sec. 7, T. 50, R. 39 W., Michigan).

A fine-grained, feebly indurated, pinkish, quartzose sandstone, sparkling from presence of crystal facets, each quartz fragment being enlarged, the enlargements being often provided with crystalline outlines. (Slides 1475, 1476.)

#### IN THE WESTERN SANDSTONE OF LAKE SUPERIOR.

#### 93. Basswood Island, Ashland County, Wisconsin.

A fine-grained, feebly indurated, white sandstone, containing besides the quartz many feldspar fragments. The quartzes are often enlarged, the enlargements being in many cases supplied with crystal facets. (Slide 53, Wis. sur. series.)

#### SILURIAN ROCKS.

#### IN THE SAINT PETER'S SANDSTONE OF WISCONSIN.

#### 94. Near Lancaster, Grant County, Wisconsin.

This rock is represented in our list only by slides kindly furnished by the Rev. A. A. Young, of New Lisbon, Wis. They are dry mountings of the sand crumbled by hand from the rock. The grains are furnished with crystal facets from secondary deposition.<sup>31</sup> (Slides 707 to 711.)

<sup>31</sup> *Amer. Jour. Sci.*, July, 1883.

## 95. Arlington Prairie, Columbia County, Wisconsin.

The Arlington Prairie is part of a large elevated area underlain by the Lower Magnesian Limestone, but dotted by here and there are small outcrops of the Saint Peter's sandstone. A group of these outcrops occurs in the southwestern part of the town of Arlington. Most of the rock of these outcrops is quite loose, and of the ordinary character of the Saint Peter's sandstone. Along its weathered surface, however, and along the sides of joint cracks, it is very much indurated, becoming even a completely vitreous quartzite for the distance of one-fourth or one-half an inch inwards from the surface. Sections of this completely vitrified portion show the quartz fragments with enlargements that everywhere fit closely together or interlock, but sections taken from an inch or two below this crust show the enlargements frequently furnished with crystal facets, the enlargements having interfused with one another sufficiently to give a slight induration. Fig. 1, Plate III, shows the appearance of a thin section of this less indurated portion as seen in the ordinary light. (Slide 724).

## 96. Gibraltar Bluff, Columbia County, Wisconsin.

A very much indurated, fine-grained rock, in which a true arenaceous texture is visible only upon the closest inspection. The rock is one which, if found among the crystalline schists, would undoubtedly be classed as a true quartzite, and the appearance of this thin section would entirely bear out this classification. It is made up really of interlocking grains of quartz of two very different sizes, the larger ones predominating. The large ones of these areas, and many of the smaller ones, show each a more or less plainly outlined fragmental nucleus. The areas interlock, often very intricately, and in every possible sense the rock is fully as "metamorphic" as any quartzite yet obtained from the Grenville formations, and yet it is a mere local phase wholly independent of any igneous or other apparent metamorphosing action, in a formation whose ordinary character is that of an incompetent sandstone. In the fresh quartzite that we have examined is the interlocking of the quartz areas, and the consequent appearance of complete original crystallization, more marked than in the sandstone. See Fig. 1, Plate III, (Slide 725).

## IN THE EUREKA QUARTZITE OF NEVADA.

## 97. Eureka, Nevada.

This rock and the three following are the ones in which Hagne and Iddings noted enlargements of quartz grains as long ago as the summer of 1881. They will be found fully described in Hagne's quadograph upon the Eureka district. Mr. Hagne has been kind enough to furnish us specimens and slides for the purpose of comparing them with quartzites which we had examined. The specimen of Eureka quartzite furnished by Mr. Hagne would be classed by us as a semi-vitreous quartzite. The enlargements of the quartz fragments, of which the rock is composed, has produced close fitting, but never any considerable interlocking. But still the rock is fully as much altered as any of the true Huronian quartzites.

## DEVONIAN.

## 98. Sandstone from the White Pine Shale, Eureka, Nevada.

A fine-grained, strongly indurated sandstone, composed of fragments of quartz and of chalcedonic or amorphous silica. The quartz fragments are often enlarged and are sometimes furnished with crystal faces. (Slide 1456.)

A. A. vol. 1, p. 407. *Geol. of Wis., vol. II, p. 583.*  
 For figures drawn from the vitrified crust of this rock see Amer. Jour. Sci., June, 1883, p. 407.

Amer. Jour. Sci., June, 1883, p. 408.

## CARBONIFEROUS.

## 99. Eureka, Nevada, Diamond Peak quartzite.

A fine-grained, greenish-drab, feldspathic quartzite. In the thin section feldspar, often much altered, is seen to compose a large proportion of the rock. The minute grains of quartz show relatively wide enlargements. (Slide 1368.)

## TRIASSIC.

## 100. Henry Mountains, Utah.

A light-gray to pinkish, fine-grained, feebly indurated sandstone from near contact with one of the laccolites. Small rounded grains of quartz compose the larger part of the rock. These have often been enlarged, and the enlargements fit somewhat closely. There are some grains of feldspar and, interstitially, calcite, fine quartz, clayey material, and iron oxide. (Slide 1367.)

## CRETACEOUS.

## 101. Courtlandt, Nicollet County, Minnesota.

A light-gray, compact, calcareous sandstone, consisting of quartz fragments embedded in a matrix of crystalline calcite. The quartz fragments, which are usually small, have quite often been enlarged. (Slide 1366.)

The sandstone is a typical example of the type which is found in the Henry Mountains. It is a light-gray, compact, calcareous sandstone, consisting of quartz fragments embedded in a matrix of crystalline calcite. The quartz fragments, which are usually small, have quite often been enlarged. (Slide 1366.)

The feldspathic sandstone immediately underlying the diabase of Eagle Harbor, Michigan, is of a uniform medium grain, a magnifying glass showing but little detail. The feldspar grains are stained red with iron oxide. If the sandstone is viewed with the power of a high microscope, in the thin section the sandstone is seen to be composed largely of grains of different feldspars, most of which in abundance are rounded complex fragments derived from a granitic porphyry, containing of feldspars bounded by a staining quartz. Then follow in order of abundance complex fragments of some altered basic rocks. Finally, a few grains of quartz and a little secondary calcite are noted. The feldspars are frequently somewhat kaolinized, but most of the grains are fresh enough to give quite distinct colors in polarized light, and in the case of the plagioclase well defined staining bands. The grains are all rounded, their boundaries being lines of little relief. However, some subparallel mineral has used these grains as nuclei

## II.

### ENLARGEMENTS OF FELDSPAR FRAGMENTS IN CERTAIN KEWEENAWAN SANDSTONES.

BY C. R. VAN HISE.

For some time past I have been on the outlook for evidence of the secondary enlargement of feldspar fragments. In the slate conglomerates of the north shore of Lake Huron (as mentioned in Part I of this bulletin) I have found what may be enlarged feldspar grains, but the evidence is not sufficiently satisfactory that any of the material is of secondary origin, the lines of separation between the supposed new material and the nuclei being illy marked. However, I have found what seem to be additions to grains of that mineral in certain of the Keweenawan feldspathic sandstones. The specimens in which the supposed enlargements were first found are taken from those portions of the sandstones almost in contact with overlying basic eruptives. This position is evidently a favorable one for the development of such enlargements, the heated alkaline waters which would naturally descend supplying appropriate conditions. Then, too, quartz enlargements, when most easily found, are shown by lines of ferrite about the nuclei, and are ordinarily best seen in the less indurated quartzites. The Keweenawan sandstones are highly ferruginous, and are of an open texture; hence, if in them the feldspar fragments have taken new growths, the conditions for their detection are favorable.

The feldspathic sandstone immediately underlying the diabase of Eagle Harbor, Michigan, is of a uniform medium grain, a magnifying glass showing but little quartz. The feldspar grains are stained red with iron oxide. Hydrochloric acid gives with the powder a slight effervescence. In the thin section the sandstone is seen to be composed largely of grains of different feldspars, next to which in abundance are rounded complex fragments derived from a granitic porphyry,<sup>1</sup> consisting of feldspars penetrated by a saturating quartz. Then follow in order of abundance complex fragments of some altered basic rocks. Finally, a few grains of quartz and a little secondary calcite are noted.

The feldspars are frequently somewhat kaolinized, but most of the grains are fresh enough to give quite uniform colors in polarized light, and, in the cases of the plagioclases, well defined twinning bands. The grains are all rounded, their boundaries being broad lines of ferrite. However, some subsequent mineral has used these grains as nuclei

<sup>1</sup> Third Annual Report U. S. Geol. Survey, p. 114.

about which to deposit, and now each individual appears in the polarized light to extend beyond its original limits. The newly formed borders as compared to the interiors are different, in that they show no decomposition and are freer from iron stains. When the borders from different feldspathic grains have extended so far as to come in contact, as they usually have done, they form sharply serrate, nicely fitting junctions, roughly comparable to the suture of a skull (Fig. 1).

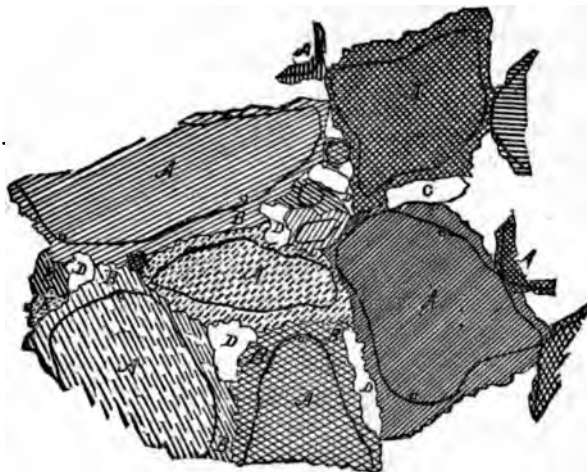


Fig. 1.—Portion of section of Eagle Harbor sandstone enlarged 50 diameters. A A A, feldspar fragments, bounded by oxide of iron borders, a a a, outside of which are enlargements, B B B, of the grains polarizing in each case with the nucleal fragment as indicated by the shading. C is a quartz fragment, D unfilled spaces, and E supposed secondary feldspars polarizing independently of the original fragments.

This newly added material appears to be feldspar, which has co-ordinated crystallographically with the grains about which it has deposited. It possesses no optical properties which would exclude that mineral, but cleavage and decomposition being absent, no comparison with feldspars can be made as to those characteristic features. The belief that the new material is feldspar is, however, based upon the following facts:

When the enlarged feldspar is orthoclase, the deposited substance polarizes uniformly with the nucleus about which it is seen (Fig. 1) ex-

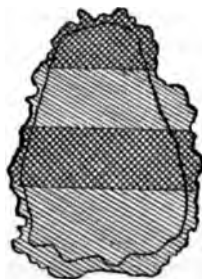


Fig. 2.—Enlarged fragment of triclinc feldspar in the Eagle Harbor sandstone, shaded so as to show how the fragment and enlargement polarize together. The black line is the heavy oxide of iron border of the original fragment.



ally, as quartz enlargements polarize with the grains in which they have grown. Further, when plagioclase fragments present the enlargements, as they frequently do, the new material is twinned uniformly with the old, the twinning bands in polarized light running directly across cores and borders (Fig. 2). This phenomenon was observed in many different grains and in different sections.

Again, the complex fragments above mentioned and derived from granitic porphyry, containing quartz and feldspar, often have enlargements, and the added portions resemble and usually polarize with the feldspars instead of with the quartz, with which they would naturally co-ordinate, if with either, were they composed of silica. Frequently the enlargements of this class of grains are apparently all of feldspar, even when a half or more of the edges of the original fragments (and in some places for considerable spaces continuously) are quartz (Fig. 3).



Fig. 3.—Enlarged fragment of feldspar, showing some quartz, from the same porphyry as Fig. 2. The black line is the oxide of iron border of the original fragment.

Finally, the complex basic fragments also have enlargements. These basic grains are often very feldspathic, the feldspar sometimes being, however, small. Here a border, instead of being a line, as is commonly the case in the preceding cases, consists of several, or many, thin layers of feldspar at the edge of the nucleus appear to have obtained the new growth, so that the new material polarizes with them in separate parts. These parts have, however, often extended upon basal areas beyond the immediately adjacent feldspars of the nucleus, but through the interlapped other feldspars whose conditions were less favorable for renewed growth, or other minerals, if such chance to be in contact with the division line between the fragment and its border.

The change which has taken place in one grain of orthoclase is of some interest. The grain has been broken into two parts, which have spread somewhat, and is now cemented with a new material which extinguishes with the original fragments, and also with the exterior second growth with which it is continuous in one place (Fig. 4.)

In some cases the new material deposited on a grain, instead of continuing as a single individual until it meets a similar growth from an-

other grain, has crystallized independently in small interlocking grains (Fig. 1). This independent feldspar (if I am correct in so considering

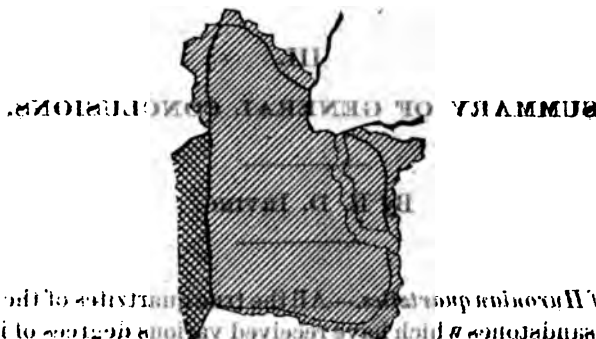
[illegible]

Fig. 1. Enlarged fragment of cathode from the Edgemoor accident. This fragment has been broken across and cemented by a material that polarizes with the original fragment and the enlargement. The black line is the oxide of iron border of the original fragment.

it) is more plentiful about the basic fragments than about the feldspar grains or those of the granitic porphyry. It would be surprising were not

Uncovered thin sections were examined with acid, and the supposed feldspar enlargements found mtt to be affected. An attempted test for hardness was apparently successful. Microchemical tests from the

This same secondary material has been found in other localities in the Keweenaw series, and in two cases the sandstone directly underlies eruptive greenstone.

It should be said that the term "Belted" is here used provisionally at least to cover (1) the original formation on the north shore of Lake Huron east of Manitowish; (2) the non-bearing formation of the Marquette and Menominee regions of Michigan and Wisconsin; (3) the slaty rocks of the Wisconsin Valley in the vicinity of Wisconsin; (4) the non-bearing rocks of the Upper Wisconsin range of Southern Wisconsin and Northwestern Minnesota; (5) the elevated slates in the Saint Louis and Mississippi basins in Minnesota; (6) the quartzites of the Gribben River region of Western Wisconsin; (7) the non-bearing quartzites of Black River Wisconsin; (8) the quartzites of the Baraboo region, Southern Wisconsin; (9) the red quartzites and sandstones of Southwestern Minnesota and southeastern Dakota; (10) the Antrim series of the Thunder Bay region on the north shore of Lake Superior; and the south-western and central Canadian belt on the Canadian border; and (11) some of the slates in the belt in the United States.

in a number of important and significant ways. It enables you and I to meet each other in a more personal way than we could have done otherwise.

### III.

#### SUMMARY OF GENERAL CONCLUSIONS.

---

By R. D. IRVING.

---

*Genesis of Huronian quartzites.*—All the true quartzites of the Huronian are merely sandstones which have received various degrees of induration by the interstitial deposition of a siliceous cement, which has generally taken the form of enlargements of the original quartz particles, less commonly of minute independently oriented areas, and still less commonly of chalcedonic or amorphous silica; two, or even all, of the three forms occurring at times in the same rock. There may have been in some cases some solution and redeposition of the original quartz material, but in the main these rocks are still made up of the fragmental constituents that composed them before induration, the fragments retaining for the most part their original contours. That these quartzites are but altered sandstones is, of course, a truth which has long been generally recognized; it is the nature of the alteration that has not been understood.

It should be said that the term "Huronian" is here used, provisionally at least, to cover (1) the original Huronian on the north shore of Lake Huron, east of Sault Sainte Marie; (2) the iron-bearing formation of the Marquette and Menominee regions of Michigan and Wisconsin; (3) the slaty rocks of the Wisconsin Valley in the vicinity of Wausau; (4) the iron-bearing rocks of the Penokee-Agoebic range of Northern Wisconsin and Northwestern Michigan; (5) the cleaved slates of the Saint Louis and Mississippi Rivers in Minnesota; (6) the quartzites of the Chippewa River region of Western Wisconsin; (7) the iron-bearing schists of Black River, Wisconsin; (8) the quartzites of the Baraboo region, Southern Wisconsin; (9) the red quartzites and sandstones of Southwestern Minnesota and Southeastern Dakota; (10) the Animikie series of the Thunder Bay region, on the north shore of Lake Superior, and thence southwestward to Pokegama Falls, on the Mississippi River; and (11) some, at least, of the folded schists of the national boundary line.

*Huronian quartzites no more "metamorphic" than numerous sandstones of later formation.*—Without perhaps being definitely so stated, the generally accepted view with regard to the production of quartzites from

sandstones has included the idea of a more or less thorough molecular rearrangement and recrystallization of the original fragmental material, quartzites having generally been classed as metamorphic or often even as crystalline rocks. But, so far as the Archæan quartzites of the Northwest are concerned, it appears that they have undergone no other alteration than that found to affect sandstones in the later and unaltered formations in all periods down to the Cretaceous. Irregular areas, and at times mere surface films<sup>35</sup> in the otherwise unaltered horizontal Potsdam and Saint Peter's sandstone in the Mississippi Valley have been changed to vitreous quartzites, indistinguishable microscopically and macroscopically from the quartzites of the Archæan, while great beds of as completely indurated quartzite as any of the Huronian are met with in the unaltered Paleozoic formations of the West. These later quartzites are plainly due to the interstitial percolation of silica-bearing waters, and to the same cause must be attributed the induration of the Huronian quartzites. In the case of the quartzites of the indurated portions of the Potsdam and Saint Peter's sandstones, no possible connection with any igneous action can be conceived, the surface crusts being due to a mere weathering, the interstitial silica-bearing waters having been drawn to the surface by evaporation and capillary action. These crusts are particularly interesting, because they are evidently in process of formation at the present time, occurring wherever the accidents of denudation have produced exposed surfaces of the rock, and one cannot conceive that either heat or pressure is concerned in their production, and yet they are as completely vitreous and crystalline as any of the true quartzites of the Huronian.

In the case of the quartzites of the Huronian and other formations where there is much interstratified eruptive material, the latter may have been the source of heated silica-bearing solutions, but I can see no reason to believe that there has been any other causal relation between igneous action and the induration of the sandstones than this.

It is of interest to note in this connection that since the quartzites of the various Huronian areas, and indeed the larger part of the other non-eruptive Huronian rocks, are in no sense more altered than any fossil-bearing quartzites, etc., of later formations, it may be taken as quite certain that the failure thus far to find fossils in the Huronian is not to be attributed to their destruction by metamorphic action, but rather to an actual, original barrenness of the series.

*Other rocks in the Huronian than true quartzites have been affected by a siliceous induration.*—It also appears that, besides the true quartzites, other rocks of the Huronian—for instance the graywackes—in which quartz is merely a subordinate, or at least not the principal, ingredient

<sup>35</sup> See Hawes's *Lithology of New Hampshire*, p. 239; Dana's *Geology*, p. 70; Geikie's *Geology*, p. 117, 127; Hawes noticed the complex character of some of the quartz fragments of certain New Hampshire quartzites, and took it to mean that these grains had been recrystallized rather than that they were originally complex.

have been affected by the same sort of siliceous induration, the indurating silica occurring both as enlargements of the quartz fragments and independently of them. Accompanying this induration there has been at times a replacement of feldspathic material by quartz, and the alteration of feldspar to chlorite, the chlorite occurring both as a pseudomorphic substitute for the feldspars, and independently crystallized in the interstices. Probably, also, the feldspar fragments have received secondary enlargements analogous to those described by Mr. Van Hise in Part II of this paper. By one or more of these processes rocks have been changed so as to present macroscopically and microscopically the appearance of more or less complete original crystallization, and yet they are made up almost entirely of the original fragmental material, the alteration which they have undergone having been merely metasomatic, and not "metamorphic" as the term is generally understood.

Besides the graywackes some at least of the mica-schists of the Huronian are mainly made up of the original fragmental material, unaltered, in some cases mingled with mica that appears to have developed *in situ*, the quartz grains often showing enlargements.

"*Metamorphism*" in the Huronian generally.—In the various Huronian areas above enumerated, one or more of quartzites, graywackes, and clay slates, with intermediate phases, make up most of the series, from which it follows that the bulk of the Huronian is made up of rocks not properly falling under the term metamorphic.<sup>36</sup> I may say, indeed,

<sup>36</sup> I am aware that the Huronian has often been spoken of as characterized mainly by other rocks than quartzites. In "Azoic Rocks" (Sec. Geol. Sur. Penn., p. 70.), Hunt speaks of Murray's first exploration of the north shore of Lake Huron as showing the existence there of "a great series of chloritic slates and conglomerates with interstratified greenstones, quartzites, and limestones." Murray's own words (Report Geol. Sur. Canada, 1847-1848, p. 109) are, "A set of regularly stratified masses, consisting of quartz rocks, or altered sandstones, conglomerates, slates, and limestones, interstratified with beds of greenstone." "Under the denomination of slates are included various thinly laminated dark green, blackish, and reddish rocks, some of which are very chloritic and some contain epidote." In Logan's description of the series (Geol. of Canada 1863, p. 55, and atlas to the same, Plate III) the Huronian section between the Mississauga and Saint Mary's Rivers is made to include 10,820 feet of quartzites, 4,280 feet of slate conglomerates, 2,000 feet of "chloritic and epidotic slates and trap-like beds," and 900 feet of limestone and chert. Of the "slate-conglomerates" a large proportion is quartzite, the balance being the graywacke, graywacke-slates, and graywacke-conglomerates of the first part of this paper. It should be said that the various intercalated greenstone layers of the series are included by Logan in these measurements. Having carefully examined the ground myself, I am convinced of the general correctness of Logan's section. At least two-thirds of the series is made up of quartzite. Of the balance the graywackes of the slate-conglomerate make up at least one-half. Of the remaining sixth, one-third is limestone and chert and the balance "chloritic and epidotic slates, and trap." But these chloritic and epidotic slates, which, although so insignificant a portion of the series, have been made to serve as its most prominent characteristic, are, as I have convinced myself by examining them in their typical development east of Thessalon Point and in the thin sections, merely eruptive, diabasic greenstones in various degrees of alteration. It is possible that the occurrence of the greenish chloritic graywackes in the slate-conglomerates has

although the matter cannot be discussed in this place, that as my studies progress, rocks in the Huronian, to which the term "metamorphic"—meaning that they are altered from fragmental sediments, but now consist chiefly or wholly of material crystallized in situ—would properly apply, grow fewer and fewer, those that remain being restricted almost entirely to regions where the series is highly folded.

*Mineral enlargements in rock alteration generally.*—The wide-spread importance of the enlargement of quartz fragments in the production of quartzites and other quartz-bearing indurated rocks being proved, naturally the lithologist is led to query as to whether fragments of other minerals, each after its kind, may not have received secondary enlargements, and, if so, how far such enlargements may have been concerned in the production of "metamorphic rocks." As a partial answer to this query we can offer the enlarged feldspar fragments of certain Keweenawan sandstones, described in Part II of this bulletin, and the apparent enlargements of feldspar fragments in certain of the feldspathic graywackes of Lake Huron. Further than this we have as yet nothing to offer. Certainly the field is one deserving of investigation. We have not studied any gneisses or similar rocks since our attention was drawn to this matter. Theoretically, one can easily see how such enlargements might be of great importance in the production of the crystalline schists, the enlargements being accompanied, perhaps, by partial solution of the fragmental material, and by processes of replacement and pseudomorphism, and by some recrystallization, pressure coming in to produce the foliation. As noted before, Bonney has already suggested the importance of this matter of enlargement of mineral fragments. His words are worth quoting here in full. Speaking of certain banded crystalline schists of the Lizard district, Cornwall, England, he says:

"It seems, then, possible to me that in these and in some of the curiously-banded rocks in the upper groups, many of the constituents may be in part original. I do not mean that any one grain, as it now stands, is an original constituent; crystallization *in situ*, especially in the case of hornblende and mica, has taken place to a large extent. In the more minutely crystalline schist, the original structure is very probably wholly obliterated. Still, these large feldspar grains, for instance, may have as their nucleus feldspar grains which were original constituents, and may have survived the dissolution of the finer sedimentary materials in which they were imbedded. Then, in the process of reconstitution, feldspar (not perhaps always of the same species) may have been added to feldspar, quartz to quartz, mica to mica, and hornblende to hornblende or altered augite. This traces of the minuter structure of

---

contributed to the idea that chloritic and epidotic crystalline rocks are its main characteristics. The type Huronian, then, i. e., that of the area between the Mississauga and Saint Mary's Rivers, should be described as a great quartzite series, including subordinate quantities of graywacke, limestone, chert, and eruptive greenstones.

the original rock, even in a highly metamorphosed series, may now and then remain. In those beds where the chemical composition of the constituents facilitated change, or where the materials were finely levigated, the agents of metamorphism reduced the whole to a mere pulp (if the expression be permissible) from which the present mineral constituents crystallized, almost as they would do from the magma of an igneous rock; but in other cases, only a portion of the material was reduced to this condition, and those constituents which remained undigested would form nuclei around which the other minerals would crystallize, and would so continue to bear testimony to the original history of the rock itself. Thus the explanation of those granitoid bands, in some cases so curiously like granite veins, may be that originally they were a rather coarse quartz-feldspar grit. As regards some of the hornblende schists, one would suggest the possibility (as I believe has been elsewhere done by the late Professor Jukes) of their having been basaltic tuffs, with which in chemical composition they would agree fairly well.

"I have ventured on this digression because these Cornish rocks have presented structures which seem to me worthy of careful consideration by all who are studying the phenomena of metamorphism—a subject which has occupied my attention for some years past. The observations are not entirely novel. Dr. Sorby drew attention to somewhat similar structures in his very valuable and suggestive paper on the original constitution and subsequent alteration of mica-schist. The agglutination of identical mineral matter has been noticed in the case of quartz by that author, by Mr. J. A. Phillips, and by myself independently, not to mention others. In the gneissic series traversed by the upper part of the St. Gothard Pass, and in other districts, I have repeatedly noticed similar instances, all tending to show that the minute structures, and in some cases very probably the original constituents (at any rate as nuclei), may be preserved in rocks which are metamorphic in the fullest sense of the word.

"I trust some day to treat the subject more fully; but I take this opportunity of calling attention to it, because I believe that in it we find a clue which may ultimately enable us to solve many difficulties in that most perplexing inquiry—the relation of the metamorphic and of the igneous rocks."<sup>37</sup>

---

<sup>37</sup> (Quarterly Journal Geol. Soc. Lond., xxxix, p. 19.)

# INDEX.

|                                                             | Page.          |                                                          | Page.                          |
|-------------------------------------------------------------|----------------|----------------------------------------------------------|--------------------------------|
| Ableman's, Wis., Quartz-schist of .....                     | 33             | "Crystallized" Sandstone, Commonness of .....            | 14                             |
| Animikie Quartzite of Pokegama Falls .....                  | 48             | —, Daubrée on .....                                      | 12                             |
| Animikie Series, Cherty rocks of .....                      | 20             | —, Gerhard on .....                                      | 12                             |
| —, Greywackes of .....                                      | 19, 36         | —, Huronian .....                                        | 15, 26, 30, 32, 35             |
| —, Quartz enlargements in rocks of .....                    | 20, 32, 35, 37 | —, Illustrations of, Pl. II. ....                        | 14                             |
| —, Quartzites of .....                                      | 16, 35, 48     | —, Naumann on .....                                      | 12                             |
| Arlington, Wis., Sandstone of .....                         | 42             | — of Arlington, Wis. ....                                | 42                             |
| Bad River, Wis., Greywacke of .....                         | 20             | — East Neebish .....                                     | 15, 26                         |
| —, Quartzite of .....                                       | 31             | — Lancaster, Wis. ....                                   | 15, 41                         |
| Baraboo Region, Wis., Huronian of .....                     | 48             | — Madison, Wis. ....                                     | 15                             |
| —, Quartzite of .....                                       | 33             | — Mount Whittlesey, Wis. ....                            | 32                             |
| —, Quartz-schist of .....                                   | 33             | — New Lisbon, Wis. ....                                  | 15                             |
| —, Sandstone of .....                                       | 40             | — Oolite .....                                           | 11                             |
| Basewood Island, Lake Superior, Sandstone of .....          | 41             | — "Old Red" .....                                        | 11                             |
| Black Bay, Lake Superior, Sandstone of .....                | 39             | — Penokee Gap, Wis. ....                                 | 15, 32                         |
| Black River Falls, Wis., Sandstone of .....                 | 16, 40         | — Potsdam Sandstone .....                                | 12, 15, 16, 18, 40             |
| —, Wis., Huronian of .....                                  | 48             | — Redstone, Minn. ....                                   | 15, 35                         |
| Bonney on Enlargements of Mineral Fragments .....           | 13, 51-52      | — Southern Wis. ....                                     | 15                             |
| Bruce Mine Bay, Lake Huron, Quartzite of .....              | 23             | — Spurr, Mount, Mich. ....                               | 30                             |
| Caledonia, Wis., Quartzite of .....                         | 33             | — Saint Peter's Sandstone .....                          | 12, 15, 41, 42                 |
| Cambrian Rocks, Enlargements of quartz fragments of .....   | 39             | — the Vosges, France. ....                               | 12                             |
| Campement d'Ours Island, Greywacke of vicinity of .....     | 27             | Dakota, southeastern, Quartzites of .....                | 34                             |
| —, Quartzite of vicinity of .....                           | 24             | Daubrée on "crystallized" sandstones .....               | 12                             |
| Champion Mine, Mich., Quartzite of .....                    | 17             | — of the Vosges .....                                    | 12                             |
| Cherty Rocks, Enlargements of quartz fragments in .....     | 20-21          | Delton, Minn., Quartzite of .....                        | 35                             |
| —, of Animikie Series .....                                 | 20             | Devil's Lake, Wis., Sandstone of .....                   | 15, 34                         |
| —, Origin of .....                                          | 21             | — quartzite of .....                                     | 34                             |
| — of the Huronian .....                                     | 21             | Devonian Rocks, Enlargement of Quartz fragments in ..... |                                |
| — Marquette region .....                                    | 20             | Dikes in quartzite of Lake Huron .....                   | 24                             |
| — Penokee region .....                                      | 20             | Eagle Harbor, Mich., Sandstone of .....                  | 38, 44-47                      |
| — Potsdam Sandstone .....                                   | 21             | East Neebish Island, Crystallized sandstone of .....     | 15, 26                         |
| —, Relation of, to the jaspery iron ores .....              | 21             | —, Quartzite of .....                                    | 25                             |
| Chippewa Valley, Wis., Huronian of .....                    | 48             | Echo River, Canada, Quartzites of .....                  | 25, 26                         |
| Clay-Slate, Enlargement of quartz fragments in .....        | 20, 32         | Enlargements of complex quartz fragments .....           | 18                             |
| — of Knife Falls, Minn. ....                                | 32             | — feldspar fragments .....                               | 44-47                          |
| — Mahtomah, Minn. ....                                      | 32             | — in Keweenaw Sandstones .....                           | 44-47                          |
| — Saint Louis River, Minn. ....                             | 32             | — in Huronian Greywackes .....                           | 19, 27                         |
| Clearwater Lake, Minn., Greywacke of .....                  | 37             | — mineral fragments, Bonney on .....                     | 13, 51, 52                     |
| Colorado Cañon, Sandstones of .....                         | 39             | — in metamorphism .....                                  | 50                             |
| Complex quartz fragments, Enlargements of .....             | 18             | — orthoclase fragments .....                             | 45                             |
| Conclusions, General .....                                  | 48-52          | — plagioclase fragments .....                            | 46                             |
| Copper Falls, Mich., Sandstone of .....                     | 38             | — quartz fragments, Fading of, into matrix .....         | 17, 20                         |
| Courtlandt, Minn., Sandstone of .....                       | 48             | —, Hague and Iddings on .....                            | 13                             |
| Cretaceous rocks, Enlargements of quartz fragments in ..... | 48             | —, Historical account of .....                           | 11-13                          |
| Crusts, Quartzitic, A. Geikie on .....                      | 13             | — in Animikie rocks .....                                | 35-38                          |
| —, of Potsdam Sandstone .....                               | 49             | — Cambrian rocks .....                                   | 39                             |
| —, of Saint Peter's Sandstone .....                         | 16, 49         | — Carboniferous rocks .....                              | 43                             |
|                                                             |                | — Cherty rocks .....                                     | 20, 31                         |
|                                                             |                | — Clay slates .....                                      | 20, 32                         |
|                                                             |                | — Cretaceous rocks .....                                 | 43                             |
|                                                             |                | — "Crystallized" sandstones .....                        | 13, 16, 26, 32, 35, 38, 40, 41 |
|                                                             |                | — Devonian rocks .....                                   | 42                             |



|                                                                            | Page.                                       |                                                                  | Page.              |
|----------------------------------------------------------------------------|---------------------------------------------|------------------------------------------------------------------|--------------------|
| Enlargement of quartz fragments in Diamond Peak quartzite of Nevada .....  | 43                                          | Huron Lake, Quartzites at McLennan's Landing .....               | 17, 24             |
| ----- Eureka quartzite of Nevada .....                                     | 42                                          | ---, --- near Thessalon Point .....                              | 23                 |
| ----- feebly indurated sandstones 16, 26, 32, 34, 35, 38, 40, 41, 43 ..... | 38                                          | ---, --- of North Shore .....                                    | 24                 |
| ----- "Gannister" of Yorkshire .....                                       | 11                                          | ---, --- Saint Joseph's Island .....                             | 26                 |
| ----- Greywackes 18, 19, 26, 27, 32, 36, 37, 38 .....                      | 23                                          | Huronian, Absence of fossils from .....                          | 49                 |
| ----- Huronian rocks .....                                                 | 38                                          | ---, Chert rocks of the .....                                    | 21                 |
| ----- Keweenaw sandstones .....                                            | 11, 13-16, 23, 35                           | ---, Crystallized sandstone .....                                | 15, 26, 30, 32, 35 |
| ----- loose sandstones .....                                               | 21, 30, 31                                  | ---, Greywackes, Enlargement of feldspar fragments in .....      | 19, 37             |
| ----- mica-schists .....                                                   | 39, 40                                      | ---, Metamorphism in the .....                                   | 19, 49, 50         |
| ----- Potsdam sandstones .....                                             | 25, 26, 29, 31, 33                          | --- of Baraboo region, Wis. ....                                 | 48                 |
| ----- quartz-schists .....                                                 | 43                                          | --- Black River, Wis. ....                                       | 48                 |
| ----- sandstone of Henry Mountains .....                                   | 41                                          | --- Chippewa Valley, Wis. ....                                   | 48                 |
| ----- Silurian rocks .....                                                 | 16, 36, 38, 39, 40, 42                      | --- Marquette region .....                                       | 48                 |
| ----- strongly indurated sandstones .....                                  | 43                                          | --- Menominee region .....                                       | 48                 |
| ----- Triassic rocks .....                                                 | 11                                          | --- Penoque region .....                                         | 48                 |
| ----- Trinidad sandstone .....                                             | 16-18, 23-26, 27-29, 30, 31, 33, 34, 35, 36 | --- Southern Minnesota .....                                     | 48                 |
| ----- Vitreous quartzites .....                                            | 42                                          | --- Saint Louis River, Minn. ....                                | 48                 |
| ----- White Pine shale .....                                               | 23-43                                       | --- Wisconsin valley .....                                       | 33                 |
| ----- List of rocks showing .....                                          | 44-47                                       | --- on Thunder Bay, Lake Superior .....                          | 48                 |
| Feldspar fragments, Enlargements of .....                                  | 49                                          | --- quartzites, Genesis of .....                                 | 48                 |
| Fossils, Absence of, from Huronian .....                                   | 33                                          | --- rocks, Enlargement of quartz fragments in .....              | 23                 |
| Freedom, Wis., Quartzite of .....                                          | 17, 28                                      | --- sandstone, Mount Whittlesey .....                            | 38                 |
| Gannister of Marquette, Mich. ....                                         | 11, 14                                      | Iddings on enlargements of quartz fragments in .....             | 13                 |
| --- Yorkshire, Eng. ....                                                   | 19, 20                                      | Indurations of sandstones by chalcedonic silica .....            | 18                 |
| Geikie on greywackes .....                                                 | 13                                          | --- by enlargement of quartz fragments .....                     | 13-17              |
| --- Induration of sandstone by weathering .....                            | 12                                          | --- by independently crystallized quartz .....                   | 17                 |
| Gerhard on crystallized sandstones .....                                   | 16, 42                                      | --- by weathering .....                                          | 12, 13, 16, 42, 49 |
| Gibraltar Bluff, Wis., Sandstone of .....                                  | 37                                          | Keweenaw Point, Greywacke of .....                               | 20                 |
| Grand Portage Falls, Minn., Greywacke of .....                             | 16                                          | --- Series, Greywacke of .....                                   | 28                 |
| Grand Rapids, Wis., Sandstone of .....                                     | 20                                          | --- sandstones, Quartz enlargements in .....                     | 38                 |
| Greywacke of Bad River, Wis. ....                                          | 27                                          | ---, Feldspar enlargements in .....                              | 44-47              |
| --- Campement d'Ours, Lake Huron .....                                     | 37                                          | Kingfisher Lake, Greywackes of .....                             | 37                 |
| --- Clearwater Lake, Minn. ....                                            | 32                                          | Knife Falls, Minn., Clay slate of .....                          | 33                 |
| --- Grand Portage Falls, Minn. ....                                        | 20                                          | ---, Lake, Minn., Slates of .....                                | 20, 37             |
| --- Keweenaw Point, Mich. ....                                             | 37                                          | Lancaster, Wis., Crystallized sandstone of .....                 | 15, 41             |
| --- Kingfisher Lake, Minn. ....                                            | 20, 37                                      | Little Iron River, Mich., Sandstone of .....                     | 38                 |
| --- Knife Lake, Minn. ....                                                 | 37                                          | Localities, List of, for rocks showing quartz enlargements ..... | 23-43              |
| --- Mountain Lake, Minn. ....                                              | 20                                          | Logan, Sir W., on the Huronian .....                             | 19, 23-27, 50      |
| --- Nonesuch Belt .....                                                    | 26                                          | Madison, Wis., Crystallized sandstone of .....                   | 15                 |
| --- Palladrea Islands, Lake Huron .....                                    | 37                                          | Mahtomah, Minn., Clay slate of .....                             | 23                 |
| --- Partridge Falls, Minn. ....                                            | 36                                          | Marquette, Mich., Gannister of .....                             | 17, 38             |
| --- Rove Lake, Wis. ....                                                   | 32                                          | ---, Quartzite of .....                                          | 16, 17, 27, 38     |
| --- Saint Louis River, Minn. ....                                          | 18, 19, 26, 27, 32, 36, 37, 38              | ---, Quartz-schist of .....                                      | 17, 29             |
| Greywackes, Enlargements of quartz fragments in .....                      | 19, 20                                      | ---, Sandstone of .....                                          | 41                 |
| ---, Geikie on .....                                                       | 49-50                                       | --- region, Cherty rocks of .....                                | 20                 |
| ---, Induration of Huronian .....                                          | 19, 32, 36                                  | ---, Huronian of .....                                           | 48                 |
| --- of Animikie Series .....                                               | 38                                          | ---, Mica-schist of .....                                        | 21, 22, 30, 31     |
| --- Keweenaw Series .....                                                  | 13                                          | Marshall Hill, Wis., Slates of .....                             | 20                 |
| Hague and Iddings on enlargement of feldspar fragments .....               | 43                                          | McDonald township, Canada, Quartzite of .....                    | 25                 |
| Henry Mountains, Utah, Sandstone of .....                                  | 11                                          | McLennan's Landing, Lake Huron, Quartzite of .....               | 17, 24             |
| Historical account of enlargement of quartz fragments .....                | 23                                          | Menominee Region, Huronian of .....                              | 48                 |
| Huron Lake, Bruce Mine Bay, Quartzites of .....                            | 24                                          | ---, Mica-schist of .....                                        | 20, 21, 22, 30, 31 |
| ---, Dikes in quartzites of .....                                          |                                             | Metamorphism in Huronian .....                                   | 19, 48, 50         |
|                                                                            |                                             | ---, Mineral enlargement in .....                                | 51                 |

|                                                | Page.              |                                              | Page.                                        |
|------------------------------------------------|--------------------|----------------------------------------------|----------------------------------------------|
| Mica-schist, Enlargement of quartz frag-       |                    | Quartzite of Echo River, Canada ..           | 25, 26                                       |
| ments in .....                                 | 21, 30, 31         | — Eureka, Nevada .....                       | 42                                           |
| — of Marquette region .....                    | 21, 22, 30, 31     | — Freedom, Wis .....                         | 33                                           |
| — — Penokee region .....                       | 21, 31             | — Marquette, Mich .....                      | 16, 17, 27, 28                               |
| Michigamme District, Mich., Mica-schist        |                    | — Minnesota (southern) .....                 | 16, 34                                       |
| of .....                                       | 21, 30, 31         | — McDonald township, Canada .....            | 25                                           |
| Microscopic rock descriptions .....            | 23-43              | — McLennan's Landing, Canada .....           | 17, 24                                       |
| Middleton, Wis., Sandstone of .....            | 40                 | — Mound Creek, Minn .....                    | 35                                           |
| Mineral Enlargements, Bonney on .....          | 13, 51-52          | — Neebish Island, Canada .....               | 16                                           |
| —, in metamorphism .....                       | 51                 | — New Ulm, Minn .....                        | 35                                           |
| Minnesota, southern, Huronian of .....         | 48                 | — Palmer Mine, Mich .....                    | 29                                           |
| —, —, Quartzites of .....                      | 16, 34             | — Penokee region, Wis .....                  | 30, 31                                       |
| Mound Creek, Minn., Quartzite of .....         | 35                 | — Pigeon Point, Minn .....                   | 36                                           |
| Mountain Lake, Minn., Greywacke of .....       | 37                 | — Portage Bay Island, Minn .....             | 16, 36                                       |
| Murray on the original Huronian .....          | 50                 | — Prairie River Falls, Minn .....            | 17, 18, 35                                   |
| National Boundary, Schists of .....            | 37                 | — Redstone, Minn .....                       | 16, 34                                       |
| Naumann on crystallized sandstones .....       | 12                 | Quartzites, Enlargements of quartz frag-     |                                              |
| Neebish Island, Quartzite of .....             | 16                 | ments in .....                               | 16-18, 25, 26, 27-29, 30, 31, 33, 34, 35, 36 |
| New Lisbon, Wis., Crystallized sand-           |                    | — Huronian, Genesis of .....                 | 48                                           |
| stone of .....                                 | 15                 | — near Thessalon Point, L. S .....           | 23                                           |
| New Ulm, Minn., Quartzite of .....             | 35                 | — of Animikie Series .....                   | 16, 35, 48                                   |
| Nipigon Bay, Sandstone of .....                | 39                 | — — north shore of Lake Huron .....          | 24                                           |
| Nonesuch Belt, Greywacke of .....              | 20                 | — Teal Lake, Mich .....                      | 28                                           |
| — mine, Sandstone of .....                     | 38                 | — Wausaugoning Bay, Wis .....                | 36                                           |
| "Old Red," Crystallized sandstone of .....     | 11                 | —, Origin of .....                           | 12                                           |
| Ontonagon River, Mich., Sandstone of .....     | 40                 | —, vitreous, Enlargement of quartz frag-     |                                              |
| Oolite, Crystallized sandstone of .....        | 11                 | ments in .....                               | 16-18, 23-26, 27-29, 30, 31, 33, 34, 35, 36  |
| Orthoclase fragments, Enlargements of .....    | 45                 | Quartz-schist, Enlargement of quartz frag-   |                                              |
| Packwaukee, Wis., Sandstone of .....           | 16, 40             | ments in .....                               | 25, 26, 29, 31, 33                           |
| Palladreau Islands, Lake Huron, Grey-          |                    | — of Ableman's, Wis .....                    | 33                                           |
| wacke of .....                                 | 26                 | — — Baraboo region .....                     | 33                                           |
| Palmer Mine, Mich., Quartzite of .....         | 29                 | — — Marquette, Mich .....                    | 17, 29                                       |
| Partridge Falls, Minn., Greywacke of .....     | 37                 | — — Penokee region, Wis .....                | 31                                           |
| Penokee region, Crystallized sandstone         |                    | Redstone, Minn., Crystallized sandstone      |                                              |
| of .....                                       | 15, 32             | of .....                                     | 15, 35                                       |
| —, Cherty rocks of .....                       | 20                 | —, Quartzite of .....                        | 16, 34                                       |
| —, Greywackes of .....                         | 20                 | Roche E'crit, Wis., Crystallized sandstone   |                                              |
| —, Huronian of .....                           | 48                 | of .....                                     | 15, 40                                       |
| —, Mica-schist of .....                        | 21, 31             | Rockland, Mich., Sandstone of .....          | 41                                           |
| —, Quartzites of .....                         | 30, 31             | Rove Lake, Minn., Greywacke of .....         | 36                                           |
| —, Quartz-schists of .....                     | 31                 | Saginaw Mine, Mich., Quartzite of .....      | 29                                           |
| Pigeon Point, Lake Superior, Quartzite of      |                    | Saint Joseph Island, Lake Huron, Quartz-     |                                              |
| Plagioclase fragments, Enlargements of .....   | 46                 | ite of .....                                 | 26                                           |
| Pokegama Falls, Minn., Quartzite of .....      | 48                 | Saint Louis River, Minn., Greywacke of ..... | 32                                           |
| Portage Bay Island, Sandstone of .....         | 16, 36             | — —, Huronian of .....                       | 48                                           |
| Portage Lake, Michigan, Sandstone of .....     | 38                 | — —, Slates of .....                         | 20, 32, 48                                   |
| Potadam Sandstone, Crystallized sands          |                    | Saint Peter's Sandstone, Crystallized sand   |                                              |
| of .....                                       | 12, 15, 16, 18, 40 | of .....                                     | 12, 15, 42                                   |
| —, Cherty sandstone of .....                   | 21                 | — —, at Arlington, Wis .....                 | 42                                           |
| —, Enlargements of quartz fragments            |                    | — —, Induration of, by weathering .....      | 12, 15, 42                                   |
| in .....                                       | 39, 40             | Sandstone, "Crystallized" .....              | 11, 12, 13, 14, 16, 26, 32,                  |
| —, Induration in, by weathering .....          | 12                 | 35, 38, 40, 41, 42                           |                                              |
| Prairie River Falls, Minn., Quartzite of ..... | 17, 18, 35         | — — Daubr e on .....                         | 12                                           |
| Presqu' Isle River, Mich., Sandstone of .....  | 39                 | — of Arlington, Wis .....                    | 42                                           |
| Quartzite of Bad River, Wis .....              | 31                 | — of East Neebish Island .....               | 15, 26                                       |
| — — Baraboo region, Wis .....                  | 33                 | — of Southern Wisconsin .....                | 15                                           |
| — — Bruce Mine Bay, Lake Huron .....           | 36                 | — of Vosges .....                            | 12                                           |
| — — Caledonia, Wis .....                       | 33                 | —, loose, Enlargements of quartz frag-       |                                              |
| — — Campement d'Ours, Lake Huron .....         | 24                 | ments in .....                               | 11, 13-16, 23, 35                            |
| — — Champion Mine, Mich .....                  | 17                 | Sandstone of Arlington, Wis .....            | 42                                           |
| — — Dakota (southeast) .....                   | 34                 | — — Baraboo, Wis .....                       | 40                                           |
| — — Delton, Minn .....                         | 35                 | — — Basswood Island, Wis .....               | 41                                           |
| — — Diamond Peak, Nevada .....                 | 43                 | — — Black Bay, Lake Superior .....           | 39                                           |
| — — East Neebish Island, Canada .....          | 25                 | — — Black River Falls, Wis .....             | 16, 40                                       |

|                                            | Page.     |                                              | Page.              |
|--------------------------------------------|-----------|----------------------------------------------|--------------------|
| Sandstone of Colorado Cañon.....           | 39        | Sorby on quartzite of Trinidad.....          | 12                 |
| — Courtlandt, Minn.....                    | 43        | — Voeges sandstone.....                      | 12                 |
| — Dakota (southeast).....                  | 34        | Spurr Mountain, Mich., Sandstone of.....     | 14, 15, 30         |
| — Devil's Lake, Wis.....                   | 15, 34    | Teal Lake, Mich., Quartzite of.....          | 23                 |
| — Delton, Minn.....                        | 35        | Thessalon Point, Lake Huron, Quartzites      |                    |
| — Eagle Harbor, Mich.....                  | 33, 44-47 | near.....                                    | 23                 |
| — Freedom, Wis.....                        | 33        | Thunder Bay, Lake Superior, Animikie         |                    |
| — Gibraltar Bluff, Wis.....                | 16, 42    | of.....                                      | 20, 25, 37         |
| — Grand Rapids, Wis.....                   | 16        | — — —, Huronian on.....                      | 48                 |
| — Henry Mountains, Utah.....               | 43        | Trinidad, W. I.....                          | 12                 |
| — Lancaster, Wis.....                      | 15, 41    | Tyler's Fork, Wis., Quartzite of.....        | 30                 |
| — Little Iron River, Mich.....             | 38        | — — —, Greywacke of.....                     | 32                 |
| — Madison, Wis.....                        | 15        | Von Cotta on crystallized sandstones.....    | 12                 |
| — Middleton, Wis.....                      | 40        | Voeges, Crystallized sandstone of.....       | 12                 |
| — Marquette, Mich.....                     | 41        | Wadsworth, M. E., on induration by           |                    |
| — Nipigon Bay, Lake Superior.....          | 39        | weathering.....                              | 18                 |
| — Nonesuch Mine, Mich.....                 | 38        | — — —, on the Torch Lake sandstone.....      | 41                 |
| — Oolite in England.....                   | 11        | Wausawangoning Bay, Minn., Quartzite of..... | 36                 |
| — "Old Red" in England.....                | 11        | Weathering of sandstones, induration by..... | 12, 13, 16, 42, 49 |
| — Ontonagon River.....                     | 40        | — — —, Galkie on.....                        | 18                 |
| — Packwaukee, Wis.....                     | 16, 40    | Western sandstone of Lake Superior, En-      |                    |
| — Penokee Gap, Wis.....                    | 15, 32    | largements of quartz fragments in.....       | 41                 |
| — Portage Bay Island, Minn.....            | 16, 36    | Westfield, Wis., Sandstone of.....           | 18                 |
| — Portage Lake, Mich.....                  | 38        | — — —, Quartzite of.....                     | 33                 |
| — Presqu' Isle River, Mich.....            | 39        | White Pine Shale, Enlargement of quartz      |                    |
| — Silver Islet Landing, Lake Superior..... | 39        | fragments in.....                            | 42                 |
| — Trinidad, W. I.....                      | 12        | Whittlesey, Mount, Huronian sandstone        |                    |
| Silica, Chalcedonic, as indurating mate-   |           | of.....                                      | 32                 |
| rial.....                                  | 18        | Winchell, N. H.....                          | 17                 |
| Silver Islet Landing, Sandstone of.....    | 39        | Wisconsin Valley, Upper, Enlargements        |                    |
| Slate, Greywacke. See Greywacke.....       | 39        | in slates of.....                            | 20                 |
| Slate of Knife Falls, Minn.....            | 32        | — — — — — Cherty rocks of.....               | 20                 |
| — — — Lake, Minn.....                      | 20, 37    | — — — Huronian of.....                       | 48                 |
| — — — Marshall Hill, Wis.....              | 20        | Young, A. A., on crystallized sand in the    |                    |
| Sorby on crystallized sandstones.....      | 11        | Potadam sandstone.....                       | 12                 |
| — — — Enlargement of quartz fragments ..   | 11        | Yorkshire, Gannister of.....                 | 11, 14             |
| — — — Gannister of Yorkshire.....          | 11, 14    | Zirkel on crystallized sandstones.....       | 12                 |
| — — — Genesis of quartzites.....           | 11-22     |                                              |                    |

## ADVERTISEMENT.

(Bulletin No. 9.)

The publications of the United States Geological Survey are issued in accordance with the statute, approved March 3, 1879, which declares that—

"The publications of the Geological Survey shall consist of the annual report of operations, geological and economic maps illustrating the resources and classifications of the lands, and reports upon general and economic geology and paleontology. The annual report of operations of the Geological Survey shall accompany the annual report of the Secretary of the Interior. All special memoirs and reports of said Survey shall be issued in uniform quarto series if deemed necessary by the Director, but otherwise in ordinary octavos. Three thousand copies of each shall be published for scientific exchanges and for sale at the price of publication; and all literary and cartographic materials received in exchange shall be the property of the United States and form a part of the library of the organization. And the money resulting from the sale of such publications shall be covered into the Treasury of the United States."

On July 7, 1882, the following joint resolution, referring to all Government publications, was passed by Congress:

"That, whenever any document or report shall be ordered printed by Congress, there shall be printed, in addition to the number in each case stated, the 'usual number' [1,900] of copies for binding and distribution among those entitled to receive them."

Under these general laws it will be seen that none of the Survey publications are furnished to it for gratuitous distribution. The 3,000 copies of the Annual Report are distributed through the document rooms of Congress. The 1,900 copies of each of the publications are distributed to the officers of the legislative and executive Departments and to stated depositories throughout the United States.

Except, therefore, in those cases where an extra number of any publication is supplied to this office by special resolution of Congress, as has been done in the case of the Second, Third, Fourth, and Fifth Annual Reports, or where a number has been ordered for its use by the Secretary of the Interior, as in the case of Williams's Mineral Resources, the Survey has no copies of any of its publications for gratuitous distribution.

### ANNUAL REPORTS.

Of the Annual Reports there have been already published:

I. First Annual Report to the Hon. Carl Schurz, by Clarence King. 1880. 8°. 79 pp. 1 map.—A preliminary report describing plan of organization and publications.

II. Report of the Director of the United States Geological Survey for 1880-'81, by J. W. Powell. 1882. 8°. lv, 588 pp. 61 pl., 1 map.

III. Third Annual Report of the United States Geological Survey, 1881-'82, by J. W. Powell. 1883. 8°. xviii, 564 pp. 67 pl. and maps.

IV. Fourth Annual Report of the United States Geological Survey, 1882-'83, by J. W. Powell. 1884. 8°. xii, 473 pp. 85 pl. and maps.

The Fifth Annual Report is in press.

### MONOGRAPHS.

So far as already determined upon, the list of the Monographs is as follows:

I. The Precious Metals, by Clarence King. In preparation.

II. Tertiary History of the Grand Cañon District, with atlas, by Capt. C. E. Dutton. Published.

III. Geology of the Comstock Lode and Washoe District, with atlas, by George F. Becker. Published.

IV. Comstock Mining and Miners, by Elliot Lord. Published.

V. Copper-bearing Rocks of Lake Superior, by Prof. R. D. Irving. Published.

VI. Older Mesozoic Flora of Virginia, by Prof. William M. Fontaine. Published.

VII. Silver-lead Deposits of Eureka, Nevada, by Joseph S. Curtiss. Published.

VIII. Paleontology of the Eureka District, Nevada, by Charles D. Walcott. In press.

IX. Brachiopoda and Lamellibranchiata of the Green Marls and Clays of New Jersey, by E. P. Whitfield.

## ADVERTISEMENT.

Geology and Mining Industry of Leadville, with atlas, by S. F. Emmons. In preparation.  
Geology of the Eureka Mining District, Nevada, with atlas, by Arnold Hague. In preparation.  
Lake Bonneville, by G. K. Gilbert. In preparation.  
Dinocerata. A monograph on an extinct order of Ungulates, by Prof. O. C. Marsh. In preparation.  
Sauropoda, by Prof. O. C. Marsh. In preparation.  
Stegosauria, by Prof. O. C. Marsh. In preparation.  
Of these Monographs, Nos. II, III, IV, V, VI, and VII are now published, viz:  
II. Tertiary History of the Grand Cañon District, with atlas, by C. E. Dutton, Capt. U. S. A. 1882. 4°. 264 pp. 42 pl. and atlas of 26 double sheets folio. Price \$10.12.  
III. Geology of the Comstock Lode and Washoe District, with atlas, by G. F. Becker. 1882. 4°. xv, 422 pp. 7 pl. and atlas of 21 sheets folio. Price \$11.  
IV. Comstock Mining and Miners, by Eliot Lord. 1883. 4°. xvi, 451 pp. 3 pl. Price \$1.50.  
V. Copper-bearing Rocks of Lake Superior, by Prof. R. D. Irving. 1883. 4°. xiv, 464 pp. 29 pl. Price \$—.  
VI. Contributions to the Knowledge of the Older Mesozoic Flora of Virginia, by William M. Fontaine. 1883. 4°. xi, 144 pp. 54 l. 54 pl. Price \$—.  
VII. Silver-lead Deposits of Eureka, Nevada, by Joseph S. Curtis. 1884. 4°. xiii, 200 pp. 15 pl. Price \$—.  
Nos. VIII and IX are in press and will soon appear. The others, to which numbers are not assigned, are in preparation.

## BULLETINS.

The Bulletins of the Survey will contain such papers relating to the general purpose of its work as do not properly come under the heads of Annual Reports or Monographs.

Each of these Bulletins will contain but one paper, and be complete in itself. They will, however, be numbered in a continuous series, and will in time be united into volumes of convenient size. To facilitate this, each Bulletin will have two paginations, one proper to itself and one which belongs to it as part of the volume.

Of this series of Bulletins, Nos. 1, 2, 3, 4, 5, 6, 7, 8, and 9 are already published, viz:

1. On Hypersthene-Andesite and on Triclinio Pyroxene in Aegitic Rocks, by Whitman Cross, with a Geological Sketch of Buffalo Peaks, Colorado, by S. F. Emmons. 1883. 8°. 42 pp. 2 pl. Price 10 cents.
2. Gold and Silver Conversion Tables, giving the coining value of Troy ounces of fine metal, &c., by Albert Williams, jr. 1883. 8°. ii, 8 pp. Price 5 cents.
3. On the Fossil Faunas of the Upper Devonian along the meridian of 76° 30', from Tompkins County, New York, to Bradford County, Pennsylvania, by Henry S. Williams. 1884. 8°. 36 pp. Price 5 cents.
4. On Mesozoic Fossils, by Charles A. White. 1884. 8°. 36 pp. 9 pl. Price 5 cents.
5. A Dictionary of Altitudes in the United States, compiled by Henry Gannett. 1884. 8°. 325 pp. Price 20 cents.
6. Elevations in the Dominion of Canada, by J. W. Spencer. 1884. 8°. 43 pp. Price 5 cents.
7. Mapoteca Geologica Americana. A Catalogue of Geological Maps of America (North and South), 1752-1881, by Jules Marcou and John Belknap Marcou. 1884. 8°. 84 pp. Price 10 cents.
8. On Secondary Enlargement of Mineral Fragments in Certain Rocks, by R. D. Irving and C. R. Vanhise. 1884. 8°. 56 pp. Price 10 cents.
9. A Report of Work done in the Washington Laboratory during the fiscal year 1883-'84. F. W. Clarke, chief chemist; T. M. Chatard, assistant. 1884. 8°. 40 pp. Price 5 cents.

## STATISTICAL PAPERS.

A fourth series of publications having special reference to the mineral resources of the United States is contemplated; of that series the first has been published, viz: Mineral Resources of the United States, by Albert Williams, jr. 1883. 8°. xvii, 813 pp. Price 50 cents.

Correspondence relating to the publications of the Survey, and all remittances, which must be by postal note or money order, should be addressed to the

DIRECTOR OF THE UNITED STATES GEOLOGICAL SURVEY,  
Washington, D. C.

WASHINGTON, D. C., August 30, 1884.

DEPARTMENT OF THE INTERIOR

---

BULLETIN

OF THE

3-26-11

UNITED STATES

GEOLOGICAL SURVEY

No. 9



WASHINGTON  
GOVERNMENT PRINTING OFFICE  
1884



**UNITED STATES GEOLOGICAL SURVEY**

**J. W. POWELL DIRECTOR**

---

**A REPORT OF WORK DONE**

**IN THE**

**WASHINGTON LABORATORY**

**DURING THE**

**FISCAL YEAR 1883-'84**

---

**F. W. CLARKE CHIEF CHEMIST**

**T. M. CHATARD ASSISTANT CHEMIST**



**WASHINGTON**  
**GOVERNMENT PRINTING OFFICE**  
**1884**





## CONTENTS.

|                                                                       |   |
|-----------------------------------------------------------------------|---|
| <b>Introductory</b> .....                                             | F |
| <b>Mineral, rock, and ore analyses</b> .....                          |   |
| Gahnite, from Montgomery County, Maryland .....                       |   |
| Jade and pectolite, from Alaska .....                                 |   |
| Saussurite, from Shasta County, California .....                      |   |
| Allanite, from Topsham, Maine .....                                   |   |
| Beryl, from Greene County, Tennessee .....                            |   |
| Damourite, from Stoneham, Maine .....                                 |   |
| Margarite .....                                                       |   |
| Cimolite, from Norway, Maine .....                                    |   |
| Halloysite, from California .....                                     |   |
| Prochlorite .....                                                     |   |
| Alum rock, from Grant County, New Mexico .....                        |   |
| Scoriaceous Obsidian, from Mono Valley, California .....              |   |
| Powder, from Truckee River, Nevada .....                              |   |
| Marl, from Pyramid Lake, Nevada .....                                 |   |
| Clays, from Mill City, Nevada .....                                   |   |
| Basalt from Mount Thielson, Oregon .....                              |   |
| Basalt, from Pit River, California .....                              |   |
| Dacites, from Lassen's Peak, California .....                         |   |
| Limestones, from Moundsville, West Virginia .....                     |   |
| Magnetite, from near Bozeman, Montana .....                           |   |
| Limonite, from Canaan Mountain, West Virginia .....                   |   |
| Coal, from Cranston, Rhode Island .....                               |   |
| <b>Water analyses</b> .....                                           |   |
| Pyramid Lake, Nevada .....                                            |   |
| Winnemucca Lake, Nevada .....                                         |   |
| Walker Lake, Nevada .....                                             |   |
| Walker River, Nevada .....                                            |   |
| Humboldt River, Nevada .....                                          |   |
| Hot Spring, foot of Granite Mountain, Nevada .....                    |   |
| Hot Spring, Hot Spring Station, Nevada .....                          |   |
| Larger Soda Lake, Ragtown, Nevada .....                               |   |
| Mono Lake, California .....                                           |   |
| Spring on Tufa Crag in Mono Lake, California .....                    |   |
| Warm Spring, Mono Basin, California .....                             |   |
| Boiling Spring, Honey Lake Valley, California .....                   |   |
| Lake Tahoe, California .....                                          |   |
| Abert Lake, Oregon .....                                              |   |
| Utah Lake, Utah .....                                                 |   |
| City Creek, Utah .....                                                |   |
| Bear River, Utah .....                                                |   |
| Utah Hot Springs .....                                                |   |
| Livingston Warm Springs, Montana .....                                |   |
| Warm Springs, Emigrant Gulch, Montana .....                           |   |
| Helena Hot Springs, Montana .....                                     |   |
| Mill Creek Cold Spring, Montana .....                                 |   |
| Virginia Hot Springs, Bath County, Virginia .....                     |   |
| <b>The estimation of alkalis in silicates, by T. M. Chatard</b> ..... |   |
| <b>Index</b> .....                                                    |   |



## **INTRODUCTORY.**

---

The present bulletin contains the more important results obtained in the chemical laboratory of the United States Geological Survey at Washington, between December 12, 1883, and June 30, 1884. The work here reported was almost wholly done by Dr. T. M. Chatard and myself, and represents the first fiscal year of our laboratory organization. Other work, carried forward in this laboratory by Dr. F. A. Gooch, and relating mainly to the rocks and waters of the Yellowstone National Park, is reserved for a future bulletin.

In addition to the analyses here published, a considerable number of assays, mineral determinations, and qualitative examinations have been made. Several researches have also been begun, but are not yet advanced enough to warrant any announcement. Other bulletins will be issued from time to time, as fast as material accumulates.

**F. W. CLARKE.**



# WORK DONE IN THE WASHINGTON LABORATORY DURING THE FISCAL YEAR 1883-'84.

## MINERAL, ROCK, AND ORE ANALYSES.

The mineralogical work of the division of chemistry has been done in close co-operation with the mineral department of the National Museum. Some of the material studied has been received through the latter institution; some has been brought in by field parties of the Survey, some represents our own summer collecting. The rocks, clays, etc., analyzed, have been submitted by other divisions of the survey, and will not be specially discussed in this bulletin. The only novelty in the methods of analysis has been in the use of the bismuth oxide process for the estimation of the alkalis in silicates. This process, as modified by Dr. Chatard, is described later.

### GAHNITE FROM GILMORE'S MICA MINE, MONTGOMERY COUNTY, MARYLAND.

The locality at which this mineral was found is 12 miles north of Washington, near Colesville, Maryland. The mine has yielded a considerable quantity of merchantable mica, which occurs in the usual granitic vein, associated with quartz, albite, garnet, black tourmaline, and beryl. The last-named mineral is abundant in large but ill-formed crystals. But one specimen of the gahnite was obtained; a dark-green mass of crystals, filling a cavity in altered feldspar. Specific gravity 4.07. Analysis by T. M. Chatard:

|                                      |             |
|--------------------------------------|-------------|
| Ignition .....                       | 30          |
| SiO <sub>2</sub> .....               | 57          |
| Al <sub>2</sub> O <sub>3</sub> ..... | 55.46       |
| Fe <sub>2</sub> O <sub>3</sub> ..... | 2.77        |
| ZnO .....                            | 40.07       |
| MgO .....                            | 59          |
| CuO .....                            | undet.      |
|                                      | <hr/> 99.76 |

### JADE AND PECTOLITE FROM ALASKA.

Among the Eskimo implements collected by the U. S. Signal Service at Point Barrow, Alaska, were a considerable number of a material which appeared to be jade. Of these there were two varieties; a pale apple-green, the other dark-green; both were highly polished, and exceedingly compact and tough. The specific gravity of the pale-green

variety was 2.873, that of the dark material was 3.012. Analyses (Clarke) gave results as follows :

|                                      | Pale-green. | Dark-green. |
|--------------------------------------|-------------|-------------|
| H <sub>2</sub> O .....               | 4.09        | 1.41        |
| SiO <sub>2</sub> .....               | 53.94       | 57.01       |
| FeO .....                            | trace.      | 6.95        |
| CaO .....                            | 32.21       | 12.75       |
| MgO .....                            | 1.43        | 21.96       |
| Al <sub>2</sub> O <sub>3</sub> ..... | 0.58        | 0.42        |
| Na <sub>2</sub> O .....              | 8.57        |             |
|                                      | 100.82      | 99.90       |

The dark-green material is plainly jade, or nephrite, quite analogous in composition to that from the Swiss lake dwellings. The light-green mineral, on the other hand, agrees in composition with pectolite. It is easily fusible, and has, in short, all the essential properties of pectolite. It is, therefore, a new and interesting variety of that well-known species.

The Eskimo of Point Barrow say that the jade and jade-like minerals used by them come from some point to the eastward. The locality itself, we believe, has not yet been visited by civilized men. Whether both minerals are found at the same place or not cannot be stated ; but we hope that before long more definite information may be secured.

#### SAUSSURITE FROM CALIFORNIA.

Found in a gabbro collected by Mr. J. S. Diller, thirty-seven miles north of Pit River Ferry, Shasta County. The mineral is nearly white, with a greenish-gray cast, and has a specific gravity of 3.148. Associated with green diallage. Analysis by F. W. Clarke :

|                                      |        |
|--------------------------------------|--------|
| Ignition .....                       | 2.42   |
| SiO <sub>2</sub> .....               | 42.79  |
| Al <sub>2</sub> O <sub>3</sub> ..... | 29.43  |
| CaO .....                            | 18.13  |
| FeO .....                            | 3.65   |
| MgO .....                            | 1.40   |
| Na <sub>2</sub> O .....              | 2.51   |
|                                      | 100.33 |

#### ALLANITE FROM TOPSHAM, MAINE.

Abundant in slender black prisms at Sprague's granite quarry. The crystals are usually much rusted upon the surface, and are known to the local quarrymen as "nails." Analysis by F. W. Clarke :<sup>1</sup>

|                                                                                                        |       |
|--------------------------------------------------------------------------------------------------------|-------|
| H <sub>2</sub> O .....                                                                                 | 4.13  |
| SiO <sub>2</sub> .....                                                                                 | 34.97 |
| Al <sub>2</sub> O <sub>3</sub> .....                                                                   | 12.83 |
| FeO .....                                                                                              | 18.11 |
| MnO .....                                                                                              | 2.82  |
| Ce <sub>2</sub> O <sub>3</sub> , La <sub>2</sub> O <sub>3</sub> , Di <sub>2</sub> O <sub>3</sub> ..... | 17.96 |
| CaO .....                                                                                              | 7.21  |
| MgO .....                                                                                              | 1.40  |
|                                                                                                        | 98.73 |

<sup>1</sup> Compare analysis by F. C. Robinson, Amer. Jour. Sci., May, 1884.

The ferrous oxide carries with it some ferric oxide. As the analysis was made merely for the complete identification of the species, the troublesome separation of the cerium group oxides was not considered necessary. The mineral appears to vary considerably in different parts of the quarry.

**BERYL FROM GREENE COUNTY, TENNESSEE.**

A typical, bluish-green translucent beryl. Analysis by F. W. Clarke:

|                                                |       |
|------------------------------------------------|-------|
| SiO <sub>2</sub> .....                         | 65.39 |
| Al <sub>2</sub> O <sub>3</sub> .....           | 13.35 |
| Al <sub>2</sub> O <sub>3</sub> (tr. FeO) ..... | 19.10 |
| Ignition .....                                 | 1.76  |
|                                                | 99.60 |

**DAMOURITE FROM STONEHAM, ME.**

Two specimens of a micaceous mineral from the topaz locality at Stoneham, collected by Mr. N. H. Perry, of South Paris, and sent by him to the National Museum, have been examined and prove to be different forms of damourite.

A. Subfibrous compact, light grayish green in color, greasy luster, associated with albite and topaz.

B. Broadly foliated micaceous, light grayish green, strong mother-of-pearl luster, also associated with topaz. Analyses (Chatard) as follows:

|                                      | A.     | B.     |
|--------------------------------------|--------|--------|
| Ignition .....                       | 4.48   | 4.78   |
| SiO <sub>2</sub> .....               | 45.19  | 45.34  |
| Al <sub>2</sub> O <sub>3</sub> ..... | 33.32  | 33.96  |
| FeO .....                            | 4.25   | 3.96   |
| MnO .....                            | 0.58   | 0.51   |
| CaO .....                            | trace. | 0.23   |
| MgO .....                            | 0.36   | 0.10   |
| Na <sub>2</sub> O .....              | 1.57   | 1.49   |
| K <sub>2</sub> O .....               | 11.06  | 10.73  |
|                                      | 100.81 | 101.09 |

**MARGARITE.**

A. From Soapstone Hill, near Gainesville, Georgia. Bright pistachio green, subfibrous aggregate of extremely minute scales surrounding and radiating from a core of bright rose-pink corundum which is in places interlaminated by the margarite. A very handsome specimen on account of the contrast of color. From Mr. Theodore Moreno, of Gainesville, Georgia. G. = 3.00; H. = 3.5. Analysis (T. M. Chatard):

|                                      |        |
|--------------------------------------|--------|
| H <sub>2</sub> O .....               | 4.88   |
| SiO <sub>2</sub> .....               | 31.72  |
| Al <sub>2</sub> O <sub>3</sub> ..... | 50.03  |
| FeO .....                            | trace. |
| CaO .....                            | 11.57  |
| MgO .....                            | 0.12   |
| Na <sub>2</sub> O .....              | 2.26   |
|                                      | 100.58 |



B. An altered crystal of corundum from Iredell County, North Carolina, showing a core of corundum surrounded by a yellowish-white, semi-micaceous, compact mineral more or less intermixed with small needles of black tourmaline. Analysis (Chatard) shows the micaceous mineral to be a margarite similar to that described by Dr. F. A. Genth as occurring at Hendrick's farm in the same county.

|                                      |              |
|--------------------------------------|--------------|
| H <sub>2</sub> O .....               | 5.68         |
| SiO <sub>2</sub> .....               | 31.15        |
| Al <sub>2</sub> O <sub>3</sub> ..... | 49.51        |
| CaO .....                            | 11.13        |
| MgO .....                            | 0.45         |
| Na <sub>2</sub> O .....              | 2.74         |
|                                      | <hr/> 100.66 |

## CIMOLITE FROM NORWAY, MAINE.

Among a collection of Maine minerals received from N. H. Perry, of South Paris, were several specimens of tourmaline and albite encrusted with a pink to rose-purple, earthy, alteration product. The color was found to be due to a little manganese, which was not, however, separately estimated. The analysis (Clarke) gave results approaching to those required by the rational formula  $AlH_3(SiO_3)_3$ , as the subjoined figures show :

|                                                 | Found.      | Theory.     |
|-------------------------------------------------|-------------|-------------|
| H <sub>2</sub> O .....                          | 9.53        | 10.4        |
| SiO <sub>2</sub> .....                          | 70.06       | 62.8        |
| Al <sub>2</sub> O <sub>3</sub> (with MnO) ..... | 17.19       | 19.8        |
| Na <sub>2</sub> O .....                         | 2.28        | .....       |
| MgO .....                                       | 0.80        | .....       |
|                                                 | <hr/> 99.86 | <hr/> 100.0 |

It will be observed at once that these results do not agree exactly with those commonly obtained for cimolite. They are too high in silica, and too low in water, and the formula deduced from them is somewhat novel. We are inclined to place the mineral, however, under cimolite, as being nearer to that species than to any other. Possibly the new formula represents the final outcome of an alteration process which ordinary cimolite has only partially undergone. Somewhat similar pink alteration products are not uncommon in the albitic granite veins of Maine and New Hampshire, and some, without analysis, have been supposed to be montmorillonite, like that of Branchville, Connecticut. A more thorough examination of such products is much to be desired.

## HALLOYSITE FROM CALIFORNIA.

Collected by Ensign J. B. Bernadou, at the Detroit Copper Mine, near Mono Lake. The specimens consisted of irregular lumps, covered and seamed with a black coating of the oxides of copper and manganese.

The color of the pure mineral was white, with a very faint tinge of blue. Analysis by F. W. Clarke.

|                                      |       |
|--------------------------------------|-------|
| H <sub>2</sub> O.....                | 18.95 |
| SiO <sub>2</sub> .....               | 42.91 |
| Al <sub>2</sub> O <sub>3</sub> ..... | 38.13 |
|                                      | <hr/> |
|                                      | 99.99 |

## PROCHLORITE.

A dark-green chlorite, collected by Mr. G. P. Merrill on Foundry Run, Georgetown, D. C., may be assigned to the above-named species. The mineral is very dark in color, scaly-crystalline, and occurs in quite fine specimens. Analysis by F. W. Clarke.

|                                      |       |
|--------------------------------------|-------|
| H <sub>2</sub> O.....                | 14.43 |
| SiO <sub>2</sub> .....               | 25.45 |
| MgO.....                             | 15.04 |
| Al <sub>2</sub> O <sub>3</sub> ..... | 17.88 |
| FeO.....                             | 24.98 |
| Na <sub>2</sub> O.....               | 0.67  |
|                                      | <hr/> |
|                                      | 98.45 |

The iron is all reckoned as ferrous iron, although part of it is undoubtedly ferric.

## SO-CALLED "ALUM ROCK" FROM GRANT COUNTY, NEW MEXICO.

Six samples were received from Hon. W. S. Rosecrans. The material is found at the headwaters of the Gila River, about 40 miles north of Silver City, and is said to cover about 2,000 acres. The specimens may be described as follows:

- A. Pinkish crusts.
- B. Yellowish crusts.
- C. Drab crusts.
- D. White crusts.
- E. Fibrous mineral of silky luster.
- F. "Gray alum rock."

Analyses by F. W. Clarke.

|                                      |    |        |
|--------------------------------------|----|--------|
|                                      | A. |        |
| Al <sub>2</sub> O <sub>3</sub> ..... |    | 15.52  |
| SO <sub>3</sub> .....                |    | 34.43  |
| H <sub>2</sub> O.....                |    | 42.56  |
| Insoluble residue.....               |    | 7.62   |
|                                      |    | <hr/>  |
|                                      |    | 100.13 |

This substance is alunogen. So, also, but impure, containing iron, are B, C, and D. Of these only rough analyses were made.

|                         | B.     | C.    | D.    |
|-------------------------|--------|-------|-------|
| Ignition .....          | 16.20  | 71.28 | 55.41 |
| AlsOs+FesOs.....        | 4.95   | 15.81 | 9.19  |
| Insoluble residue ..... | 78.95  | 12.27 | 33.19 |
|                         | <hr/>  | <hr/> | <hr/> |
|                         | 100.10 | 99.36 | 97.79 |

The analysis of E shows it to be halotrichite. Only a trace of ferri iron is present. Color nearly white, slightly grayish. Asbestiform.

## E.

|                                      |             |
|--------------------------------------|-------------|
| Al <sub>2</sub> O <sub>3</sub> ..... | 7.27        |
| FeO .....                            | 13.59       |
| SO <sub>3</sub> .....                | 37.19       |
| H <sub>2</sub> O .....               | 40.62       |
| Insoluble .....                      | 0.50        |
|                                      | <hr/> 99.17 |

F, which was not analyzed, is merely an impure mixture of alunogen and halotrichite.

## SCORIACEOUS OBSIDIAN, SOUTHEAST SIDE OF MONO VALLEY, CALIFORNIA.

A grayish-white rock which forms a large portion of the Mono craters. Collected by I. C. Russell. Analysis by T. M. Chatard.

|                                                                              |             |
|------------------------------------------------------------------------------|-------------|
| Ignition .....                                                               | 2.20        |
| SiO <sub>2</sub> .....                                                       | 74.05       |
| Al <sub>2</sub> O <sub>3</sub> (trace Fe <sub>2</sub> O <sub>3</sub> ) ..... | 13.85       |
| CaO .....                                                                    | 0.90        |
| MgO .....                                                                    | 0.07        |
| K <sub>2</sub> O .....                                                       | 4.31        |
| Na <sub>2</sub> O .....                                                      | 4.60        |
|                                                                              | <hr/> 99.98 |

## WHITE POWDER FROM LAHONTAN LAKE-BEDS, TRUCKEE RIVER.

A volcanic dust which fell in the quaternary Lake Lahontan. Supposed to have been erupted from the Mono craters. Collected by I. C. Russell. Analysis by T. M. Chatard.

|                                                                          |              |
|--------------------------------------------------------------------------|--------------|
| H <sub>2</sub> O .....                                                   | 3.91         |
| SiO <sub>2</sub> .....                                                   | 71.15        |
| Al <sub>2</sub> O <sub>3</sub> (+ Fe <sub>2</sub> O <sub>3</sub> ) ..... | 15.95        |
| CaO .....                                                                | 0.85         |
| MgO .....                                                                | 0.41         |
| MnO .....                                                                | trace.       |
| K <sub>2</sub> O .....                                                   | 3.36         |
| Na <sub>2</sub> O .....                                                  | 4.94         |
|                                                                          | <hr/> 100.57 |

## MARL FROM "WHITE TERRACE," 3 MILES WEST OF MULLEN'S SPRINGS, WEST SHORE OF PYRAMID LAKE, NEVADA.

Mostly deposited from the waters of the prehistoric Lake Lahontan. Collected by I. C. Russell. Analysis by T. M. Chatard.

|                                      |              |
|--------------------------------------|--------------|
| CaCO <sub>3</sub> .....              | 64.82        |
| SiO <sub>2</sub> .....               | 22.00        |
| Al <sub>2</sub> O <sub>3</sub> ..... | 5.14         |
| Fe <sub>2</sub> O <sub>3</sub> ..... | 2.04         |
| CaO .....                            | 0.93         |
| MgO .....                            | 1.89         |
| H <sub>2</sub> O .....               | 3.32         |
|                                      | <hr/> 100.14 |

## TWO CLAYS FROM HUMBOLDT RIVER BRIDGE, MILL CITY, NEVADA.

A. From Upper Lahontan Lake-beds. B. From Lower Lahontan Lake-beds. Collected by I. C. Russell. Analyzed by T. M. Chatard. Color in both cases grayish.

|                                      | A.     | B.     |
|--------------------------------------|--------|--------|
| Ignition .....                       | 9.78   | 13.08  |
| SiO <sub>2</sub> .....               | 56.30  | 50.70  |
| Al <sub>2</sub> O <sub>3</sub> ..... | 16.52  | *19.01 |
| Fe <sub>2</sub> O <sub>3</sub> ..... | 5.08   | .....  |
| CaO .....                            | 5.45   | 10.26  |
| MgO .....                            | 2.64   | 3.19   |
| K <sub>2</sub> O .....               | 2.17   | 2.16   |
| Na <sub>2</sub> O .....              | 2.60   | 1.91   |
|                                      | 100.54 | 100.26 |

\* With a little Fe<sub>2</sub>O<sub>3</sub>.

## BASALT FROM MOUNT THIELSON, OREGON.

Material collected by J. S. Diller; by whom also the lithological separations were made. Analyses of rock and component parts as follows:

A. Basalt. F. W. Clarke.

B. Groundmass. T. M. Chatard.

C. Hypersthene. T. M. Chatard.

D. Feldspar, specific gravity, 2.637–2.714. T. M. Chatard.

E. Feldspar, specific gravity, 2.714–2.877. T. M. Chatard.

|                                      | A.     | B.     | C.      | D.     | E.     |
|--------------------------------------|--------|--------|---------|--------|--------|
| Ignition .....                       | .60    | .52    | .....   | .40    | .66    |
| SiO <sub>2</sub> .....               | 55.68  | 53.85  | 53.31   | 51.95  | 55.48  |
| TiO <sub>2</sub> .....               | undet. | .....  | .....   | trace. | .39    |
| Al <sub>2</sub> O <sub>3</sub> ..... | 18.93  | 22.95  | 5.99    | 23.84  | 23.91  |
| Fe <sub>2</sub> O <sub>3</sub> ..... | } 8.73 | 4.59   | { 13.43 | 2.24   | 2.32   |
| FeO .....                            |        |        |         |        |        |
| CaO .....                            | 7.99   | 8.41   | 3.69    | 11.42  | 8.11   |
| MgO .....                            | 4.86   | 3.08   | 21.69   | 1.34   | 2.27   |
| Na <sub>2</sub> O .....              | 2.12   | 2.16   | .....   | 3.22   | 3.14   |
| K <sub>2</sub> O .....               | .48    | 2.67   | .....   | .59    | .72    |
|                                      | 99.39  | 100.23 | 98.11   | 100.00 | 100.00 |

In B a trace of P<sub>2</sub>O<sub>5</sub> was found, and in C a trace of manganese. D and E are near labradorite, and are evidently mixtures. C, D, and E were received in very small quantities; not sufficient for full analysis. D and E therefore were treated with hydrofluoric acid, in order to render possible the estimation of the alkalis, and silica was taken by difference.

Less than half a gramme of a fulgurite, formed by the fusion of this basalt by lightning, was also partially analyzed. The results (Clarke) are as follows:

|                                      |             |
|--------------------------------------|-------------|
| Ignition .....                       | 1.11        |
| SiO <sub>2</sub> .....               | 55.04       |
| Al <sub>2</sub> O <sub>3</sub> ..... | } 28.99     |
| Fe <sub>2</sub> O <sub>3</sub> ..... |             |
| CaO .....                            | 7.86        |
| MgO .....                            | 5.85        |
| Alkalies .....                       | undet.      |
|                                      | <hr/> 98.85 |

**BASALT FROM PIT RIVER, NORTH OF BURNEY VALLEY, CALIFORNIA.**

Collected by J. S. Diller. Analysis by F. W. Clarke.

|                                                               |             |
|---------------------------------------------------------------|-------------|
| Ignition .....                                                | 1.54        |
| SiO <sub>2</sub> .....                                        | 51.92       |
| Al <sub>2</sub> O <sub>3</sub> .....                          | 19.76       |
| FeO (includes a little Fe <sub>2</sub> O <sub>3</sub> ) ..... | 11.21       |
| CaO .....                                                     | 9.30        |
| MgO .....                                                     | 3.38        |
| Na <sub>2</sub> O .....                                       | 2.16        |
| K <sub>2</sub> O .....                                        | 0.60        |
|                                                               | <hr/> 99.87 |

**DACITES FROM LASSEN'S PEAK, CALIFORNIA.**

Collected by J. S. Diller. Analyses by T. M. Chatard.

A. Gray dacite.

B. Reddish dacite.

C. Inclusion in dacite.

|                                      | A.           | B.           | C.          |
|--------------------------------------|--------------|--------------|-------------|
| Ignition .....                       | 0.56         | 0.44         | 1.35        |
| SiO <sub>2</sub> .....               | 69.51        | 68.20        | 58.97       |
| Al <sub>2</sub> O <sub>3</sub> ..... | 15.75        | 16.98        | 18.60       |
| Fe <sub>2</sub> O <sub>3</sub> ..... | 3.34         | 3.75         | 5.94        |
| CaO .....                            | 1.71         | 4.33         | 2.84        |
| MgO .....                            | 2.09         | 2.07         | 6.89        |
| Na <sub>2</sub> O .....              | 3.89         | 2.98         | 3.05        |
| K <sub>2</sub> O .....               | 3.34         | 1.52         | 2.24        |
| P <sub>2</sub> O <sub>5</sub> .....  | trace        | .....        | undet.      |
|                                      | <hr/> 100.19 | <hr/> 100.27 | <hr/> 99.88 |

## TWO SAMPLES OF LIMESTONE FROM MOUNDSVILLE NARROWS, TWELVE MILES BELOW WHEELING, W. VA.

A. Upper ledge. B. Lower ledge. Analyses by T. M. Chatard.

|                                             | A.     | B.     |
|---------------------------------------------|--------|--------|
| Moisture .....                              | 0.05   | 0.10   |
| Insoluble .....                             | 10.33  | 1.53   |
| CO <sub>2</sub> .....                       | 39.18  | 43.16  |
| CaO .....                                   | 43.02  | 53.26  |
| MgO .....                                   | 1.08   | 0.93   |
| Fe <sub>2</sub> O <sub>3</sub> .....        | 0.90   | 0.96   |
| MnO and P <sub>2</sub> O <sub>5</sub> ..... | traces | traces |
|                                             | 99.56  | 99.94  |

## EQUIVALENT TO—

|                                                   |       |       |
|---------------------------------------------------|-------|-------|
| Moisture .....                                    | 0.05  | 0.10  |
| CaCO <sub>3</sub> .....                           | 85.75 | 95.10 |
| MgCO <sub>3</sub> .....                           | 2.26  | 1.95  |
| FeCO <sub>3</sub> .....                           | 0.73  | 0.79  |
| Sand, clay, and Fe <sub>2</sub> O <sub>3</sub> .. | 10.77 | 2.00  |
|                                                   | 99.56 | 99.94 |

## MAGNETIC IRON ORE FROM NEAR BOZEMAN, MONTANA.

Found in the Gallatin Range, between Middle and Bozeman Creeks, southwest of Bozeman.

Received from A. C. Peale. Analysis by T. M. Chatard.

|                                      |         |
|--------------------------------------|---------|
| Insoluble (SiO <sub>2</sub> ) .....  | 0.165   |
| Fe <sub>3</sub> O <sub>4</sub> ..... | 96.49   |
| FeS <sub>2</sub> (S=0.171) .....     | 0.321   |
| Al <sub>2</sub> O <sub>3</sub> ..... | 0.04    |
| MnO .....                            | 0.93    |
| CaO .....                            | trace.  |
| MgO .....                            | 0.072   |
| TiO <sub>2</sub> .....               | 2.71    |
| P <sub>2</sub> O <sub>5</sub> .....  | 0.012   |
|                                      | 100.740 |

The titanium was determined in a separate portion, and is probably high from presence of iron.

(257)

## LIMONITE FROM CANAAN MT., TUCKER COUNTY, W. VA.

Analysis by T. M. Chatard.

|                                      |        |
|--------------------------------------|--------|
| Fe <sub>2</sub> O <sub>3</sub> ..... | 80.53  |
| Moisture .....                       | 13.20  |
| SiO <sub>2</sub> .....               | 1.95   |
| P <sub>2</sub> O <sub>5</sub> .....  | 1.98   |
| S .....                              | trace. |
| CaO .....                            | 2.34   |
| MnO .....                            | none.  |
|                                      | <hr/>  |
|                                      | 100.00 |

## COAL FROM CRANSTON, R. I.

Analysis by F. A. Gooch. Specific gravity, 2.209 at 150.

|                       |        |
|-----------------------|--------|
| Water .....           | 0.24   |
| Volatile matter ..... | 4.49   |
| Fixed carbon .....    | 82.20  |
| Ash .....             | 13.07  |
|                       | <hr/>  |
|                       | 100.00 |
| Sulphur .....         | 0.34   |

(258)

## WATER ANALYSES.

With the exceptions of the waters from Montana, the Utah Hot Springs, and the Virginia Hot Springs, the following waters were collected by the Division of the Great Basin, under the direction of Messrs. G. K. Gilbert and I. C. Russell. For sufficient reasons, it was necessary to abbreviate the analyses as much as possible, and this was done by avoiding the direct estimation of carbonic acid. Whenever carbonates were proved to be present all the other ingredients of a water were determined and the carbonic acid, reckoned as  $\text{CO}_2$ , was taken as the difference between the sum of their weights and the weight of the total solid residue. In computing the probable compounds formed by the union of acids and bases, the chlorides and sulphates were first disposed of, and the bases in excess were then calculated as carbonates. This procedure gave usually a summation a little greater or less than the total solids directly found upon evaporating the water to dryness; and the variation of the result from 100 per cent. afforded a means of estimating the probable accuracy of the analysis. In most cases the samples of water received were insufficient for a search after the less common elements. These, therefore, were necessarily ignored, except in so far as the spectroscope or qualitative tests could reveal their presence. The gaseous contents of the waters received no consideration. In certain respects, therefore, all the analyses are to be regarded as imperfect; although they are fully adequate for the geological purposes which led to their being made.

Each analysis is stated in three columns. First, the actual weight in grammes to the liter of each constituent. Second, the percentage of each relatively to the total solid residue. Third, the probable combination, also in grammes to the liter. The second column gives a means of comparing different waters as to their composition, irrespective of their greater or less salinity. The third column was computed in the simplest terms, and not with reference to complex and doubtful hypotheses.

### PYRAMID LAKE, NEVADA.

Four samples of water were analyzed (Clarke), as follows:

- A. Water of north end of the lake, near the surface.
- B. Water of north end of the lake, depth of 108 meters.
- C. Water of south end of the lake, near the surface.
- D. Water of south end of the lake, depth of 61 meters.

All four samples contained suspended flakes of silicious and calcareous matter.



## A.

[Total solids, 3.4987 grammes to liter.]

| Found.                        | Per cent.<br>of total<br>solids. | Probable combination.                        |
|-------------------------------|----------------------------------|----------------------------------------------|
| SiO <sub>2</sub> ..... 0.0412 | 1.17                             | SiO <sub>2</sub> ..... 0.0412                |
| SO <sub>4</sub> ..... 0.1803  | 5.15                             | KCl ..... 0.1474                             |
| Cl ..... 1.4298               | 40.87                            | NaCl ..... 2.2411                            |
| Ca ..... 0.0179               | 0.51                             | Na <sub>2</sub> SO <sub>4</sub> ..... 0.2667 |
| Mg ..... 0.0800               | 2.29                             | Na <sub>2</sub> CO <sub>3</sub> ..... 0.4738 |
| Na ..... 1.1731               | 33.53                            | CaCO <sub>3</sub> ..... 0.0447               |
| K ..... 0.0766                | 2.19                             | MgCO <sub>3</sub> ..... 0.2800               |
|                               | 2.9989                           |                                              |
| CO <sub>2</sub> ..... 0.4998  | 14.29                            | 99.94 per cent. accounted for.               |
|                               | 3.4987                           | 100.00                                       |

## B.

[Total solids: 3.4837 grammes to liter.]

| Found.                        | Per cent.<br>of total<br>solids. | Probable combination.                        |
|-------------------------------|----------------------------------|----------------------------------------------|
| SiO <sub>2</sub> ..... 0.0200 | 0.57                             | SiO <sub>2</sub> ..... 0.0200                |
| SO <sub>4</sub> ..... 0.1850  | 5.31                             | KCl ..... 0.1381                             |
| Cl ..... 1.4342               | 41.17                            | NaCl ..... 2.2550                            |
| Ca ..... 0.0179               | 0.51                             | Na <sub>2</sub> SO <sub>4</sub> ..... 0.2737 |
| Mg ..... 0.0805               | 2.31                             | Na <sub>2</sub> CO <sub>3</sub> ..... 0.4756 |
| Na ..... 1.1817               | 33.92                            | CaCO <sub>3</sub> ..... 0.0447               |
| K ..... 0.0723                | 2.07                             | MgCO <sub>3</sub> ..... 0.2818               |
|                               | 2.9916                           |                                              |
| CO <sub>2</sub> ..... 0.4921  | 14.14                            | Total, 100.15 per cent.                      |
|                               | 3.4837                           | 100.00                                       |

## C.

[Total solids: 3.4725 grammes to liter.]

| Found.                        | Per cent.<br>of total<br>solids. | Probable combination.                        |
|-------------------------------|----------------------------------|----------------------------------------------|
| SiO <sub>2</sub> ..... 0.0425 | 1.22                             | SiO <sub>2</sub> ..... 0.0425                |
| SO <sub>4</sub> ..... 0.1772  | 5.10                             | KCl ..... 0.1374                             |
| Cl ..... 1.4288               | 41.15                            | NaCl ..... 2.2466                            |
| Ca ..... 0.0179               | 0.51                             | Na <sub>2</sub> SO <sub>4</sub> ..... 0.2621 |
| Mg ..... 0.0752               | 2.17                             | Na <sub>2</sub> CO <sub>3</sub> ..... 0.4940 |
| Na ..... 1.1826               | 34.06                            | CaCO <sub>3</sub> ..... 0.0447               |
| K ..... 0.0719                | 2.07                             | MgCO <sub>3</sub> ..... 0.2632               |
|                               | 2.9782                           |                                              |
| CO <sub>2</sub> ..... 0.4943  | 14.23                            | 99.23 per cent. accounted for.               |
|                               | 3.4725                           | 100.00                                       |

## D.

[Total solids: 3.4900 grammes to liter.]

| Found.                        | Percent<br>of total<br>solids. | Probable combination.                        |
|-------------------------------|--------------------------------|----------------------------------------------|
| SiO <sub>2</sub> ..... 0.0300 | 0.86                           | SiO <sub>2</sub> ..... 0.0300                |
| SO <sub>4</sub> ..... 0.1864  | 5.34                           | KCl ..... 0.1887                             |
| Cl ..... 1.4271               | 40.99                          | NaCl ..... 2.2428                            |
| Ca ..... 0.0832               | 2.38                           | Na <sub>2</sub> SO <sub>4</sub> ..... 0.2757 |
| Mg ..... 0.0832               | 2.38                           | Na <sub>2</sub> CO <sub>3</sub> ..... 0.4634 |
| Na ..... 1.1809               | 33.84                          | CaCO <sub>3</sub> ..... 0.2913               |
| K ..... 0.0726                | 2.13                           | MgCO <sub>3</sub> ..... 0.2913               |
|                               | 2.9802                         | 3.4618                                       |
| CO <sub>2</sub> ..... 0.5098  | 14.46                          | 09.19 per cent. accounted for.               |
|                               | 3.4900                         | 100.00                                       |

The slight differences between these analyses may be attributed in part to the fact that the lake is fed at its southern end by a large stream of fresh water. The four percentage columns may be conveniently compared in the following table:

|                        | A.     | B.     | C.     | D.     |
|------------------------|--------|--------|--------|--------|
| Total solids.....      | 3.4987 | 3.4837 | 3.4725 | 3.4900 |
| SiO <sub>2</sub> ..... | 1.17   | 0.57   | 1.22   | 0.86   |
| SO <sub>4</sub> .....  | 5.15   | 5.31   | 5.10   | 5.34   |
| Cl.....                | 40.87  | 41.17  | 41.15  | 40.99  |
| Ca.....                | 0.51   | 0.51   |        |        |
| Mg.....                | 2.29   | 2.31   | 2.17   | 2.38   |
| Na.....                | 33.53  | 33.92  | 34.06  | 33.84  |
| K.....                 | 2.19   | 2.07   | 2.07   | 2.13   |
| CO <sub>2</sub> .....  | 14.29  | 14.14  | 14.23  | 14.46  |
|                        | 100.00 | 100.00 | 100.00 | 100.00 |

## WINNEMUCCA LAKE, NEVADA.

Specific gravity of water, 1.001, at 17°. Analysis by F. W. Clarke.

[Total solids: 3.6025 grammes to liter.]

| Found.                        | Percent<br>of total<br>solids. | Probable combination.                        |
|-------------------------------|--------------------------------|----------------------------------------------|
| SiO <sub>2</sub> ..... 0.0275 | 0.76                           | SiO <sub>2</sub> ..... 0.0275                |
| SO <sub>4</sub> ..... 0.1333  | 3.70                           | KCl ..... 0.1310                             |
| Cl ..... 1.6934               | 47.01                          | NaCl ..... 2.6877                            |
| Ca ..... 0.0196               | 0.54                           | Na <sub>2</sub> SO <sub>4</sub> ..... 0.1973 |
| Mg ..... 0.0173               | 0.48                           | Na <sub>2</sub> CO <sub>3</sub> ..... 0.4065 |
| Na ..... 1.2970               | 36.00                          | CaCO <sub>3</sub> ..... 0.0254               |
| K ..... 0.0686                | 1.90                           | MgCO <sub>3</sub> ..... 0.0494               |
|                               | 3.2567                         | 3.5347                                       |
| CO <sub>2</sub> ..... 0.3458  | 9.61                           | 92.44 per cent. accounted for.               |
|                               | 3.6025                         | 100.00                                       |

## WALKER LAKE, NEVADA.

Two analyses (Clarke) were made; one of a sample taken just below the surface, the other of water from a depth of 65.5 meters. Both were collected by Mr. I. C. Russell.

## A.—Surface sample.

[Total solids: 2.5155 grammes to the liter.]

| Found.                        | Per cent.<br>of total<br>solids. | Probable combination.                        |
|-------------------------------|----------------------------------|----------------------------------------------|
| SiO <sub>2</sub> ..... 0.0075 | 0.29                             | SiO <sub>2</sub> ..... 0.0075                |
| SO <sub>4</sub> ..... 0.5275  | 20.96                            | NaCl ..... 0.9681                            |
| Cl ..... 0.5875               | 23.36                            | Na <sub>2</sub> SO <sub>4</sub> ..... 0.7808 |
| Ca ..... 0.0287               | 1.06                             | Na <sub>2</sub> CO <sub>3</sub> ..... 0.5157 |
| Mg ..... 0.0391               | 1.55                             | CaCO <sub>3</sub> ..... 0.0667               |
| Na ..... 0.8577               | 34.11                            | MgCO <sub>3</sub> ..... 0.1860               |
| K ..... trace.                |                                  | 2.4752                                       |
| 2.0460                        |                                  | 98.39 per cent. accounted for.               |
| CO <sub>2</sub> ..... 0.4695  | 18.67                            |                                              |
| 2.5155                        | 100.00                           |                                              |

## B.—Lower sample.

[Total solids: 2.4875 grammes to the liter.]

| Found.                        | Per cent.<br>of total<br>solids. | Probable combination.                        |
|-------------------------------|----------------------------------|----------------------------------------------|
| SiO <sub>2</sub> ..... 0.0075 | .30                              | SiO <sub>2</sub> ..... 0.0075                |
| SO <sub>4</sub> ..... 0.5125  | 20.60                            | NaCl ..... 0.9558                            |
| Cl ..... 0.5800               | 23.32                            | Na <sub>2</sub> SO <sub>4</sub> ..... 0.7580 |
| Ca ..... 0.0176               | .71                              | Na <sub>2</sub> CO <sub>3</sub> ..... 0.5339 |
| Mg ..... 0.0375               | 1.51                             | CaCO <sub>3</sub> ..... 0.0440               |
| Na ..... 0.8530               | 34.29                            | MgCO <sub>3</sub> ..... 0.1313               |
| K ..... trace.                |                                  | 2.4305                                       |
| 2.0081                        |                                  | 97.66 per cent. accounted for.               |
| CO <sub>2</sub> ..... 0.4794  | 19.27                            |                                              |
| 2.4875                        | 100.00                           |                                              |

Mud taken from the bottom of the Lake, at a depth of 68 meters, was also examined qualitatively by Dr. Chatard. The portion soluble in water contained chlorides of sodium and potassium, with some sulphates and traces of borates. The residue, extracted with hydrochloric acid, was found to contain carbonates of lime and magnesia, with some phosphates, iron, alumina, and alkalies. The insoluble portion was impure silica.

## WALKER RIVER, NEVADA.

The sample of water was collected immediately below the junction of the east and west branches. Analysis by F. W. Clarke.

[Total solids: 0.1800 grammes to the liter.]

| Found.                       | Per cent.<br>of total<br>solids. | Probable combination.                       |
|------------------------------|----------------------------------|---------------------------------------------|
| SiO <sub>2</sub> ..... .0225 | 12.50                            | SiO <sub>2</sub> ..... .0225                |
| SO <sub>4</sub> ..... .0284  | 15.77                            | NaCl ..... .0216                            |
| Cl ..... .0181               | 7.28                             | Na <sub>2</sub> SO <sub>4</sub> ..... .0421 |
| Ca ..... .0228               | 12.66                            | Na <sub>2</sub> CO <sub>3</sub> ..... .0224 |
| Mg ..... .0038               | 2.12                             | CaCO <sub>3</sub> ..... .0670               |
| Na ..... .0318               | 17.67                            | MgCO <sub>3</sub> ..... .0183               |
|                              |                                  | 0.1789                                      |
| CO <sub>2</sub> ..... .0576  | 32.00                            | 99.39 per cent. accounted for.              |
|                              | 100.00                           |                                             |

## HUMBOLDT RIVER, NEVADA.

Sample collected at Stone House. Analysis by T. M. Chatard.

[Total solids: 0.3615 grammes to the liter.]

| Found.                                     | Per cent.<br>of total<br>solids. | Probable combination.                       |
|--------------------------------------------|----------------------------------|---------------------------------------------|
| SiO <sub>2</sub> ..... .0326               | 9.08                             | SiO <sub>2</sub> ..... .0326                |
| Al <sub>2</sub> O <sub>3</sub> ..... .0013 | 0.37                             | Al <sub>2</sub> O <sub>3</sub> ..... .0013  |
| SO <sub>4</sub> ..... .0477                | 13.12                            | KCl ..... .0157                             |
| Cl ..... .0075                             | 2.08                             | K <sub>2</sub> CO <sub>3</sub> ..... .0046  |
| Ca ..... .0489                             | 13.53                            | Na <sub>2</sub> CO <sub>3</sub> ..... .0550 |
| Mg ..... .0124                             | 3.46                             | Na <sub>2</sub> SO <sub>4</sub> ..... .0705 |
| Na ..... .0467                             | 12.92                            | CaCO <sub>3</sub> ..... .1223               |
| K ..... .0100                              | 2.77                             | MgCO <sub>3</sub> ..... .0424               |
|                                            |                                  | 0.3453                                      |
| CO <sub>2</sub> ..... .1544                | 42.72                            | 95.52 per cent. accounted for.              |
|                                            | 100.00                           |                                             |

If the loss in the last column is due to the presence of alkaline bicarbonates, and reckoned in the latter form to make up 100 per cent., we have—

|                                       |       |
|---------------------------------------|-------|
| Na <sub>2</sub> CO <sub>3</sub> ..... | .0200 |
| NaHCO <sub>3</sub> .....              | .0512 |

## HOT SPRING, WARD'S RANCH, FOOT OF GRANITE MOUNTAIN, NEVADA.

Analysis by T. M. Chatard.

[Total solids: 1.1902 grammes to the liter.]

| Found.                              | Per cent.<br>of total<br>solids. | Probable combination.                         |
|-------------------------------------|----------------------------------|-----------------------------------------------|
| SiO <sub>2</sub> ..... 0.1136       | 9.60                             | SiO <sub>2</sub> , free ..... 0.0180          |
| SO <sub>4</sub> ..... 0.3901        | 32.97                            | Na <sub>2</sub> SiO <sub>3</sub> ..... 0.1942 |
| Cl ..... 0.2396                     | 20.25                            | Na <sub>2</sub> SO <sub>4</sub> ..... 0.4287  |
| CO <sub>2</sub> ..... trace         | -----                            | NaCl ..... 0.3665                             |
| Ca ..... 0.0367                     | 3.10                             | KCl ..... 0.0363                              |
| Mg ..... 0.0034                     | 0.29                             | CaSO <sub>4</sub> ..... 0.1247                |
| Na ..... 0.3554                     | 30.03                            | MgSO <sub>4</sub> ..... 0.0179                |
| K ..... 0.0191                      | 1.61                             |                                               |
| Li ..... trace                      |                                  | 1.1834                                        |
| O for SiO <sub>2</sub> ..... 0.0255 | 2.15                             | 99.43 per cent. accounted for.                |
| 1.1834                              | 100.00                           |                                               |

## HOT SPRING, AT HOT SPRING STATION, NEVADA, C. P. R. R.

Analysis by T. M. Chatard.

[Total solids: 2.4924 grammes to the liter.]

| Found.                             | Per cent.<br>of total<br>solids. | Probable combination.                                        |
|------------------------------------|----------------------------------|--------------------------------------------------------------|
| SiO <sub>2</sub> ..... 0.2788      | 11.14                            | SiO <sub>2</sub> , free ..... 0.2080                         |
| SO <sub>4</sub> ..... 0.3555       | 14.25                            | Na <sub>2</sub> SiO <sub>3</sub> ..... 0.1480                |
| Cl ..... 0.9679                    | 38.79                            | NaCl ..... 1.4946                                            |
| Ca ..... 0.0305                    | 1.23                             | Na <sub>2</sub> SO <sub>4</sub> ..... 0.4039                 |
| Mg ..... 0.0010                    | 0.04                             | KCl ..... 0.1278                                             |
| Al ..... 0.0010                    | 0.04                             | Al <sub>2</sub> (SO <sub>4</sub> ) <sub>3</sub> ..... 0.0063 |
| Na ..... 0.7743                    | 31.04                            | MgSO <sub>4</sub> ..... 0.0050                               |
| K ..... 0.0669                     | 2.69                             | CaSO <sub>4</sub> ..... 0.1087                               |
| Li ..... trace                     |                                  | 2.4953                                                       |
| O in SiO <sub>2</sub> ..... 0.0194 | .78                              | 100.11 per cent. accounted for.                              |
| 2.4953                             | 100.00                           |                                                              |

## LARGER SODA LAKE, NEAR RAGTOWN, NEVADA.

Specific gravity of water, 1.101. Two analyses (Chatard) were made, one of a sample taken just below the surface, the other of water from a depth of 30.5 meters.

A.—*Surface sample.*

[Total solids: 125.1300 grammes to the liter.]

| Found.                                    | Percent.<br>of total<br>solids. | Probable combination.                                     |
|-------------------------------------------|---------------------------------|-----------------------------------------------------------|
| SiO <sub>2</sub> ..... 0.304              | 0.24                            | SiO <sub>2</sub> ..... 0.304                              |
| SO <sub>4</sub> ..... 12.960              | 10.36                           | KCl ..... 4.820                                           |
| Cl ..... 45.690                           | 36.51                           | NaCl ..... 71.470                                         |
| B <sub>2</sub> O <sub>7</sub> ..... 0.314 | 0.25                            | Na <sub>2</sub> SO <sub>4</sub> ..... 19.170              |
| Mg ..... 0.270                            | 0.22                            | Na <sub>2</sub> CO <sub>3</sub> ..... 23.640              |
| Na ..... 45.840                           | 36.63                           | Na <sub>2</sub> B <sub>4</sub> O <sub>7</sub> ..... 0.404 |
| K ..... 2.520                             | 2.01                            | MgCO <sub>3</sub> ..... 0.940                             |
| 107.898                                   |                                 | 123.518                                                   |
| CO <sub>2</sub> ..... 17.232              | 13.78                           | 98.71 per cent. accounted for.                            |
| 125.130                                   | 100.00                          |                                                           |

If the loss in the last column be reckoned as due to the presence of bicarbonates, it gives, to make up 100 per cent.:

|                                       |        |
|---------------------------------------|--------|
| Na <sub>2</sub> CO <sub>3</sub> ..... | 23.640 |
| NaHCO <sub>3</sub> .....              | 4.382  |

B.—*Lower sample.*

[Total solids: 125.1500 grammes to the liter.]

| Found.                                    | Per cent.<br>of total<br>solids. | Probable combination.                                     |
|-------------------------------------------|----------------------------------|-----------------------------------------------------------|
| SiO <sub>2</sub> ..... 0.310              | 0.25                             | SiO <sub>2</sub> ..... 0.310                              |
| SO <sub>4</sub> ..... 13.150              | 10.50                            | KCl ..... 5.110                                           |
| Cl ..... 44.270                           | 35.38                            | NaCl ..... 68.980                                         |
| B <sub>2</sub> O <sub>7</sub> ..... 0.327 | 0.26                             | Na <sub>2</sub> SO <sub>4</sub> ..... 19.450              |
| Mg ..... 0.270                            | 0.21                             | Na <sub>2</sub> CO <sub>3</sub> ..... 24.840              |
| Na ..... 44.270                           | 35.38                            | Na <sub>2</sub> B <sub>4</sub> O <sub>7</sub> ..... 0.417 |
| K ..... 2.670                             | 2.13                             | MgCO <sub>3</sub> ..... 0.940                             |
| 105.267                                   |                                  | 119.997                                                   |
| CO <sub>2</sub> ..... 19.883              | 15.89                            | 95.88 per cent. accounted for.                            |
| 125.150                                   | 100.00                           |                                                           |

Reckoning the loss in the last column as in the case of the surface sample, we have—

|                                       |        |
|---------------------------------------|--------|
| Na <sub>2</sub> CO <sub>3</sub> ..... | 16.040 |
| NaHCO <sub>3</sub> .....              | 13.953 |

From the waters of this lake sodium carbonate is manufactured upon a commercial scale. Several brines and products obtained in this manufacture were qualitatively examined by Dr. Chatard. A more complete investigation may be undertaken at some future time. A pale pink-colored brine, from which summer soda had been taken, and in which salt had begun to crystallize, was found to contain carbonates, chlorides, and sulphates of sodium and potassium, with some alkaline phosphates and borates. The pink color was probably due to organic matter. A concentrated brine from the Little Soda Lake contained similar ingredients, minus the phosphates. In a crystalline mass from a vat at the same locality the same constituents were found, with phosphates and a trace of lime. From this vat five annual crops of soda were said to have been taken. The sodium carbonate as it goes to market from the smaller Soda Lake, contains as impurities, sand, clay, considerable chloride, some sulphate, a little borate, a trace of phosphate, and some potassium salts.

MONO LAKE, CALIFORNIA.\*

A sample of water taken near the surface. Analysis by T. M. Chatard. Specific gravity, 1.045 at 15°.5.

[Total solids: 51.8500 grammes to the liter.]†

| Found.                                     | Per cent.<br>of total<br>solids. | Probable combination.                                      |
|--------------------------------------------|----------------------------------|------------------------------------------------------------|
| SiO <sub>2</sub> ..... 0.2800              | 0.54                             | SiO ..... 0.2800                                           |
| SO <sub>4</sub> ..... 6.8100               | 13.11                            | KCl ..... 2.2300                                           |
| Cl ..... 12.1300                           | 23.39                            | NaCl ..... 18.2200                                         |
| B <sub>2</sub> O <sub>3</sub> ..... 0.1600 | 0.34                             | Na <sub>2</sub> SO <sub>4</sub> ..... 10.0700              |
| Ca ..... 0.2900                            | 0.55                             | Na <sub>2</sub> B <sub>4</sub> O <sub>7</sub> ..... 0.2000 |
| Mg ..... 0.1300                            | 9.28                             | Na <sub>2</sub> CO <sub>3</sub> ..... 19.4900              |
| Na ..... 18.9100                           | 36.46                            | CaCO <sub>3</sub> ..... 0.6800                             |
| K ..... 1.1600                             | 2.23                             | MgCO <sub>3</sub> ..... 0.3600                             |
|                                            |                                  |                                                            |
|                                            | 39.8700                          | 51.5300                                                    |
| CO <sub>2</sub> ..... 11.9800              | 23.10                            | 99.60 per cent. accounted for.                             |
|                                            | 51.8500                          | 100.00                                                     |

Mud from the bottom of the lake, taken at a depth of over 30 meters, was also examined qualitatively. The portion soluble in water contained chlorides of potassium and sodium, no sulphates, some carbonates, and traces of sulphides. The portion soluble in hydrochloric acid contained iron, alumina, lime, and alkalis, with a little boric acid. The insoluble residue consisted of sand and silica.

\* A second sample of Mono Lake water, taken from a depth of 30 meters, contained 53.8560 grammes to the liter.

**SPRING ON TUFA CRAG, IN MONO LAKE.**

**Analysis by T. M. Chatard.**

[Total solids: 0.2918 gramme to the liter.]

| Found.                       | Per cent.<br>of total<br>solids. | Probable combination.                       |
|------------------------------|----------------------------------|---------------------------------------------|
| SiO <sub>2</sub> ..... 0.178 | 6.10                             | SiO <sub>2</sub> ..... 0.178                |
| SO <sub>4</sub> ..... 0.546  | 18.71                            | KCl ..... 0.169                             |
| Cl ..... 0.144               | 4.93                             | NaCl ..... 0.104                            |
| Ca ..... 0.414               | 14.19                            | Na <sub>2</sub> SO <sub>4</sub> ..... 0.799 |
| Mg ..... 0.044               | 1.51                             | Na <sub>2</sub> CO <sub>3</sub> ..... 0.056 |
| Na ..... 0.513               | 17.58                            | CaCO <sub>3</sub> ..... 1.085               |
| K ..... 0.088                | 3.02                             | MgCO <sub>3</sub> ..... 0.154               |
| ..... 0.1927                 |                                  | ..... 0.2945                                |
| CO <sub>2</sub> ..... 0.0991 | 33.96                            | Total, 100.91 per cent.                     |
| ..... 0.2918                 | 100.00                           |                                             |

The water of the "Petroleum Spring," on an island in Mono Lake, yielded a solid residue of 0.8775 gramme to the liter. It contains carbonates, chlorides, and silicates; the bases being sodium, potassium, calcium, magnesium, and aluminum.

**WARM SPRING. AT WARM SPRING STATION, MONO BASIN.**

**Analysis by T. M. Chatard.**

**[Total solids : 2.0850 grammes to the liter.]**

| Found.                               | Per cent.<br>of total<br>solids. | Probable combination.                  |
|--------------------------------------|----------------------------------|----------------------------------------|
| SiO <sub>2</sub> .....               | 0. 1545                          | 7. 46                                  |
| SO <sub>4</sub> .....                | 0. 3131                          | 15. 13                                 |
| Cl .....                             | 0. 2272                          | 10. 98                                 |
| Ca .....                             | 0. 0589                          | 2. 84                                  |
| Mg .....                             | 0. 0604                          | 2. 92                                  |
| Na .....                             | 0. 6116                          | 29. 56                                 |
| K .....                              | 0. 0630                          | 3. 05                                  |
| Li .....                             | trace.                           | .....                                  |
| Al <sub>2</sub> O <sub>3</sub> ..... | 0. 0018                          | 0. 09                                  |
| 1. 4905                              |                                  |                                        |
| CO <sub>2</sub> .....                | 0. 5945                          | 27. 97                                 |
| 2. 0650                              | 100. 00                          |                                        |
|                                      |                                  | Al <sub>2</sub> O <sub>3</sub> .....   |
|                                      |                                  | KCl .....                              |
|                                      |                                  | NaCl .....                             |
|                                      |                                  | Na <sub>2</sub> SO <sub>4</sub> .....  |
|                                      |                                  | Na <sub>2</sub> SiO <sub>3</sub> ..... |
|                                      |                                  | Na <sub>2</sub> CO <sub>3</sub> .....  |
|                                      |                                  | CaCO <sub>3</sub> .....                |
|                                      |                                  | MgCO <sub>3</sub> .....                |
|                                      |                                  | 2. 5892                                |
|                                      |                                  | 90. 24 per cent. accounted for.        |



BOILING SPRING, FOUR MILES S. E. OF SHAFFER'S RANCH, HONEY LAKE VALLEY, CALIFORNIA.

Analysis by T. M. Chatard.

[Total solids : 1.0218 gramme to the liter.]

| Found.                             | Per cent.<br>of total<br>solids. | Probable combination.                         |
|------------------------------------|----------------------------------|-----------------------------------------------|
| SiO <sub>2</sub> ..... 0.1310      | 12.83                            | SiO <sub>2</sub> , free ..... 0.1008          |
| SO <sub>4</sub> ..... 0.3492       | 34.19                            | Na <sub>2</sub> SiO <sub>3</sub> ..... 0.0513 |
| Cl ..... 0.2070                    | 20.27                            | Na <sub>2</sub> SO <sub>4</sub> ..... 0.4715  |
| Ca ..... 0.0121                    | 1.18                             | NaCl ..... 0.3206                             |
| Mg ..... 0.0004                    | 0.04                             | KCl ..... 0.0180                              |
| Na ..... 0.3040                    | 29.78                            | Ca SO <sub>4</sub> ..... 0.0409               |
| K ..... 0.0094                     | 0.92                             | Mg SO <sub>4</sub> ..... 0.0020               |
| O for SiO <sub>2</sub> .... 0.0080 | 0.79                             | 1.0211                                        |
| 1.0211                             | 100.00                           | 99.93 per cent. accounted for.                |

Two other springs in Honey Lake Valley were examined qualitatively. In the water of the High Rock Spring were found carbonates, chlorides, and sulphates of calcium, magnesium, sodium and potassium, with a little silica. The Lower Hot Spring contained chlorides and sulphates of the same bases.

#### LAKE TAHOE, CALIFORNIA.

Analysis by F. W. Clarke.

[Total solids : 0.0730 gramme to the liter.]

| Found.                       | Per cent.<br>of total<br>solids. | Probable combination.                       |
|------------------------------|----------------------------------|---------------------------------------------|
| SiO <sub>2</sub> ..... .0137 | 18.77                            | SiO <sub>2</sub> ..... .0137                |
| SO <sub>4</sub> ..... .0054  | 7.40                             | KCl ..... .0034                             |
| Cl ..... .0023               | 3.14                             | NaCl ..... .0013                            |
| Ca ..... .0038               | 12.74                            | K <sub>2</sub> SO <sub>4</sub> ..... .0034  |
| Mg ..... .0030               | 4.11                             | Na <sub>2</sub> SO <sub>3</sub> ..... .0062 |
| Na ..... .0073               | 10.00                            | Na <sub>2</sub> CO <sub>3</sub> ..... .0117 |
| K ..... .0033                | 4.52                             | CaCO <sub>3</sub> ..... .0233               |
| ..... .0443                  |                                  | MgCO <sub>3</sub> ..... .0105               |
| CO <sub>2</sub> ..... .0287  | 39.32                            | .0723                                       |
| .0730                        | 100.00                           | 99.04 per cent. accounted for.              |

#### ABERT LAKE, OREGON.

The water of this lake was collected by I. C. Russell, at a point about 150 meters off from the west shore. It was analyzed by Mr. F. W. Taylor, of the Smithsonian Institution, and the analysis is here included

merely for the purpose of completing the series of waters specially examined for the division of the Great Basin. Specific gravity, 1.02317.

*Contents in one liter.*

|                                      |              |
|--------------------------------------|--------------|
| SiO <sub>2</sub> .....               | 0.065        |
| NaCl .....                           | 7.217        |
| KCl .....                            | 8.455        |
| K <sub>2</sub> SO <sub>4</sub> ..... | 0.921        |
| K <sub>2</sub> CO <sub>3</sub> ..... | 10.691       |
| MgCO <sub>3</sub> .....              | 10.006       |
|                                      | <hr/> 27.355 |

An efflorescence from the north shore of the lake, examined qualitatively by T. M. Chatard, contained carbonates and chlorides of sodium and potassium, with traces of sulphates, phosphates, and calcium.

UTAH LAKE, UTAH.

Analysis by F. W. Clarke.

[Total solids: 6.3060 gramme to the liter.]

| Found.                       | Per cent.<br>of total<br>solids. | Probable combination.                       |
|------------------------------|----------------------------------|---------------------------------------------|
| SiO <sub>2</sub> ..... .0100 | 3.27                             | SiO <sub>2</sub> ..... .0100                |
| SO <sub>4</sub> ..... .1306  | 42.68                            | NaCl ..... .0204                            |
| Cl ..... .0124               | 4.04                             | Na <sub>2</sub> CO <sub>3</sub> ..... .0204 |
| Ca ..... .0558               | 18.24                            | CaSO <sub>4</sub> ..... .1849               |
| Mg ..... .0186               | 6.08                             | CaCO <sub>3</sub> ..... .0088               |
| Na ..... .0178               | 5.81                             | MgCO <sub>3</sub> ..... .0644               |
|                              |                                  | <hr/> .3039                                 |
| CO <sub>2</sub> ..... .0608  | 19.88                            | 90.31 per cent accounted for.               |
|                              | <hr/> 100.00                     |                                             |

A little potassium is present, but was not separately estimated.

CITY CREEK, UTAH.

Water collected above the reservoir which supplies Salt Lake City. Analysis by T. M. Chatard.

[Total solids: 0.2400 gramme to the liter.]

| Found.                                     | Per cent.<br>of total<br>solids. | Probable combination.                       |
|--------------------------------------------|----------------------------------|---------------------------------------------|
| SiO <sub>2</sub> ..... .0090               | 3.69                             | SiO <sub>2</sub> ..... .0090                |
| Al <sub>2</sub> O <sub>3</sub> ..... .0010 | 0.41                             | Al <sub>2</sub> O <sub>3</sub> ..... .0010  |
| SO <sub>4</sub> ..... .0070                | 2.87                             | NaCl ..... .0216                            |
| Cl ..... .0131                             | 5.38                             | Na <sub>2</sub> CO <sub>3</sub> ..... .0014 |
| Ca ..... .0580                             | 24.19                            | CaSO <sub>4</sub> ..... .0090               |
| Mg ..... .0174                             | 7.15                             | CaCO <sub>3</sub> ..... .1400               |
| Na ..... .0091                             | 3.74                             | MgCO <sub>3</sub> ..... .0606               |
|                                            |                                  | <hr/> .2435                                 |
| CO <sub>2</sub> ..... .1215                | 52.57                            | Total, 101.45 per cent.                     |
|                                            | <hr/> 100.00                     |                                             |

## BEAR RIVER, UTAH.

Analysis by F. W. Clarke.

[Total solids: 0.1845 gramme to the liter.]

| Found.                       | Per cent.<br>of total<br>solids. | Probable combination.                       |
|------------------------------|----------------------------------|---------------------------------------------|
| SiO <sub>2</sub> ..... .0070 | 3.79                             | SiO <sub>2</sub> ..... .0070                |
| SO <sub>4</sub> ..... .0105  | 5.69                             | NaCl ..... .0081                            |
| Cl ..... .0049               | 2.65                             | Na <sub>2</sub> SO <sub>4</sub> ..... .0155 |
| Ca ..... .0432               | 23.41                            | CaCO <sub>3</sub> ..... .1080               |
| Mg ..... .0125               | 6.78                             | MgCO <sub>3</sub> ..... .0438               |
| Na ..... .0082               | 4.44                             | ..... .1824                                 |
| ..... .0863                  |                                  | 98.86 per cent accounted for.               |
| CO <sub>2</sub> ..... .0982  | 53.24                            |                                             |
| ..... .1845                  | 100.00                           |                                             |

## UTAH HOT SPRINGS, EIGHT MILES N. OF OGDEN, UTAH.

Water received through the Smithsonian Institution. Reported temperature 55°. Analysis by F. W. Clarke.

[Total solids: 23.1150 grammes to the liter.]

| Found.                                      | Per cent.<br>of total<br>solids. | Probable combination.                       |
|---------------------------------------------|----------------------------------|---------------------------------------------|
| SiO <sub>2</sub> ..... 0.0460               | 0.20                             | SiO <sub>2</sub> ..... 0.0460               |
| Al <sub>2</sub> O <sub>3</sub> ..... 0.0040 | 0.02                             | Al <sub>2</sub> O <sub>3</sub> ..... 0.0040 |
| SO <sub>4</sub> ..... 0.2184                | 0.94                             | KCl ..... 1.6732                            |
| Cl ..... 13.7030                            | 59.28                            | NaCl ..... 18.0168                          |
| Br ..... trace.                             | .....                            | CaCl <sub>2</sub> ..... 2.9187              |
| CO <sub>2</sub> ..... undet.                | .....                            | MgCl <sub>2</sub> ..... 0.1398              |
| Ca ..... 1.1428                             | 4.83                             | CaSO <sub>4</sub> ..... 0.3094              |
| Mg ..... 0.0929                             | 0.40                             | MgCO <sub>3</sub> ..... 0.2016              |
| Na ..... 7.0825                             | 30.64                            | ..... 23.3095                               |
| K ..... 0.8759                              | 3.79                             | Total, 100.84 per cent.                     |
| Li ..... trace.                             |                                  |                                             |
| ..... 23.1655                               | 100.10                           |                                             |

The CO<sub>2</sub> in the last column, having been proved to be present, was computed to satisfy the excess of magnesium after the other acids had all been balanced. The water as received contained no iron in solution, but held an abundant ferruginous deposit.

## LIVINGSTON WARM SPRINGS, MONTANA.

Water received from A. C. Peale. Analysis by F. W. Clarke. Free  $H_2S$  present.

[Total solids: 0.7575 gramme to the liter.]

| Found.                       | Per cent.<br>of total<br>solids. | Probable combination.                       |
|------------------------------|----------------------------------|---------------------------------------------|
| SiO <sub>2</sub> ..... .0290 | 3.83                             | SiO <sub>2</sub> ..... .0290                |
| SO <sub>4</sub> ..... .2224  | 29.37                            | KCl ..... .0078                             |
| Cl ..... .0124               | 1.64                             | NaCl ..... .0143                            |
| Ca ..... .1678               | 22.11                            | Na <sub>2</sub> CO <sub>3</sub> ..... .0461 |
| Mg ..... .0438               | 5.79                             | CaCO <sub>3</sub> ..... .1880               |
| Na ..... .0256               | 3.38                             | CaSO <sub>4</sub> ..... .3150               |
| K ..... .0041                | 0.55                             | MgCO <sub>3</sub> ..... .1533               |
| ..... .5051                  |                                  | ..... .7535                                 |
| CO <sub>2</sub> ..... .2524  | 33.33                            | 99.47 per cent. accounted for.              |
| ..... .7575                  | 100.00                           |                                             |

## WARM SPRINGS OF EMIGRANT GULCH, YELLOWSTONE VALLEY, MONTANA.

Water received from A. C. Peale. Analysis by F. W. Clarke.

[Total solids: 0.2350 gramme to the liter.]

| Found.                       | Per cent.<br>of total<br>solids. | Probable combination.                       |
|------------------------------|----------------------------------|---------------------------------------------|
| SiO <sub>2</sub> ..... .0317 | 13.49                            | SiO <sub>2</sub> ..... .0317                |
| SO <sub>4</sub> ..... .0329  | 14.00                            | KCl ..... .0083                             |
| Cl ..... .0074               | 3.15                             | NaCl ..... .0058                            |
| Ca ..... .0346               | 14.72                            | Na <sub>2</sub> SO <sub>4</sub> ..... .0487 |
| Mg ..... .0077               | 3.28                             | Na <sub>2</sub> CO <sub>3</sub> ..... .0274 |
| Na ..... .0299               | 12.72                            | CaCO <sub>3</sub> ..... .0665               |
| K ..... .0043                | 1.83                             | MgCO <sub>3</sub> ..... .0269               |
| ..... .1485                  |                                  | ..... .2353                                 |
| CO <sub>2</sub> ..... .0865  | 36.81                            | Total, 100.13 per cent.                     |
| ..... .2350                  | 100.00                           |                                             |

Water received from A. C. Peale. Reported temperature, 60.5°. Analysis by F. W. Clarke.

| Found.                 | Per cent.<br>of total<br>solids. | Probable combination.                 |              |
|------------------------|----------------------------------|---------------------------------------|--------------|
| SiO <sub>2</sub> ..... | .0938                            | SiO <sub>2</sub> .....                | .0938        |
| SO <sub>4</sub> .....  | .1854                            | NaCl.....                             | .0596        |
| Cl.....                | .0362                            | Na <sub>2</sub> CO <sub>3</sub> ..... | .1730        |
| Ca.....                | .0107                            | CaCO <sub>3</sub> .....               | .0268        |
| Mg.....                | trace.                           | Na <sub>2</sub> SO <sub>4</sub> ..... | .2742        |
| Na.....                | .1873                            |                                       | <u>.6374</u> |
| K.....                 | trace.                           | Total, 100.79 per cent.               |              |
| Li.....                | trace.                           |                                       |              |
|                        | <u>.5134</u>                     |                                       |              |
| CO <sub>2</sub> .....  | .1091                            |                                       |              |
|                        | <u>.6225</u>                     |                                       |              |
|                        | 100.00                           |                                       |              |

Water received from A. C. Peale. Highly effervescent. Reported temperature, 4.5°. Analysis by F. W. Clarke.

| Found.                                                             | Per cent.<br>of total<br>solids. | Probable combination.          |
|--------------------------------------------------------------------|----------------------------------|--------------------------------|
| SiO <sub>2</sub> .....                                             | 0.0250                           | 0.06                           |
| Al <sub>2</sub> O <sub>3</sub> . Fe <sub>2</sub> O <sub>3</sub> .. | 0.0875                           | 2.29                           |
| SO <sub>4</sub> .....                                              | 0.6500                           | 17.05                          |
| Cl .....                                                           | 0.2771                           | 7.27                           |
| I .....                                                            | trace.                           | .....                          |
| Ca .....                                                           | 0.3768                           | 9.88                           |
| Mg .....                                                           | 0.0811                           | 2.13                           |
| Na .....                                                           | 0.8814                           | 23.12                          |
| K .....                                                            | 0.0513                           | 1.34                           |
| Li .....                                                           | trace.                           | .....                          |
|                                                                    | 2.4302                           |                                |
| CO <sub>2</sub> .....                                              | 1.3823                           | 36.26                          |
|                                                                    | 3.8125                           | 100.00                         |
|                                                                    |                                  | 99.31 per cent. accounted for. |

(272)

## VIRGINIA HOT SPRINGS, BATH COUNTY, VIRGINIA.

The waters of six different springs were received from the Virginia Hot Springs Company, as follows:

- A. Boiler bath. Temperature, 41° C.
- B. Hot spout bath. Temperature, 40° 5 C.
- C. Octagon bath. Temperature, 38° C.
- D. New hot spring. Temperature, 37° C.
- E. "Sulphur" bath. Temperature, 36° 5 C.
- F. "Magnesian" spring. Temperature, 25° 5 C.

Analyses by F. W. Clarke. Traces of bromine were found in A and B. The other waters were so similar to these that bromine was not specially sought for in them.

## A.—Boiler bath.

[Total solids: 0.5975 gramme to the liter.]

| Found.                                     | Per cent.<br>of total<br>solids. | Probable combination.                       |
|--------------------------------------------|----------------------------------|---------------------------------------------|
| SiO <sub>2</sub> ..... .0275               | 4.60                             | SiO <sub>2</sub> ..... .0275                |
| SO <sub>4</sub> ..... .1319                | 22.07                            | Al <sub>2</sub> O <sub>3</sub> ..... .0020  |
| Cl..... .0050                              | 0.83                             | KCl..... .0105                              |
| Al <sub>2</sub> O <sub>3</sub> ..... .0020 | 0.32                             | K <sub>2</sub> SO <sub>4</sub> ..... .0138  |
| Ca..... .1356                              | 22.69                            | Na <sub>2</sub> SO <sub>4</sub> ..... .0370 |
| Mg..... .0337                              | 5.96                             | CaSO <sub>4</sub> ..... .1407               |
| Na..... .0120                              | 2.08                             | CaCO <sub>3</sub> ..... .2355               |
| K..... .0117                               | 1.95                             | MgCO <sub>3</sub> ..... .1249               |
|                                            |                                  | <hr/>                                       |
|                                            |                                  | .5919                                       |
| CO <sub>2</sub> ..... .2361                | 39.50                            | 99.06 per cent. accounted for.              |
|                                            |                                  | <hr/>                                       |
|                                            | 100.00                           |                                             |

## B.—Hot spout bath.

[Total solids: 0.5925 gramme to the liter.]

| Found.                                     | Per cent.<br>of total<br>solids. | Probable combination.                       |
|--------------------------------------------|----------------------------------|---------------------------------------------|
| SiO <sub>2</sub> ..... .0235               | 3.97                             | SiO <sub>2</sub> ..... .0235                |
| SO <sub>4</sub> ..... .1298                | 21.91                            | Al <sub>2</sub> O <sub>3</sub> ..... .0025  |
| Cl..... .0044                              | 0.74                             | KCl..... .0082                              |
| Al <sub>2</sub> O <sub>3</sub> ..... .0025 | 0.42                             | K <sub>2</sub> SO <sub>4</sub> ..... .0187  |
| Ca..... .1375                              | 23.21                            | Na <sub>2</sub> SO <sub>4</sub> ..... .0281 |
| Mg..... .0343                              | 5.79                             | CaSO <sub>4</sub> ..... .1424               |
| Na..... .0091                              | 1.53                             | CaCO <sub>3</sub> ..... .2390               |
| K..... .0132                               | 2.23                             | MgCO <sub>3</sub> ..... .1201               |
|                                            |                                  | <hr/>                                       |
|                                            |                                  | .5885                                       |
| CO <sub>2</sub> ..... .2682                | 40.20                            | 98.46 per cent. accounted for.              |
|                                            |                                  | <hr/>                                       |
|                                            | 100.00                           |                                             |

C.—*Octagon bath.*

[Total solids: 0.5940 gramme to the liter.]

| Found.                                     | Per cent.<br>of total<br>solids. | Probable combination.                       |
|--------------------------------------------|----------------------------------|---------------------------------------------|
| SiO <sub>2</sub> ..... .0255               | 4.29                             | SiO <sub>2</sub> ..... .0255                |
| SO <sub>4</sub> ..... .1364                | 22.96                            | Al <sub>2</sub> O <sub>3</sub> ..... .0035  |
| Cl..... .0041                              | 0.69                             | KCl..... .0086                              |
| Al <sub>2</sub> O <sub>3</sub> ..... .0035 | 0.59                             | K <sub>2</sub> SO <sub>4</sub> ..... .0185  |
| Ca..... .1378                              | 23.20                            | Na <sub>2</sub> SO <sub>4</sub> ..... .0296 |
| Mg..... .0348                              | 5.86                             | CaSO <sub>4</sub> ..... .1504               |
| Na..... .0096                              | 1.61                             | CaCO <sub>3</sub> ..... .2340               |
| K..... .0128                               | 2.15                             | MgCO <sub>3</sub> ..... .1218               |
| ..... .3645                                |                                  | ..... .5919                                 |
| CO <sub>2</sub> ..... .2295                | 38.65                            | 99.64 per cent. accounted for.              |
| ..... .5940                                | 100.00                           |                                             |

D.—*New hot spring.*

[Total solids: 0.5740 gramme to the liter.]

| Found.                                     | Per cent.<br>of total<br>solids. | Probable combination.                       |
|--------------------------------------------|----------------------------------|---------------------------------------------|
| SiO <sub>2</sub> ..... .0235               | 4.09                             | SiO <sub>2</sub> ..... .0235                |
| SO <sub>4</sub> ..... .1294                | 22.54                            | Al <sub>2</sub> O <sub>3</sub> ..... .0060  |
| Cl..... .0029                              | 0.50                             | KCl..... .0061                              |
| Al <sub>2</sub> O <sub>3</sub> ..... .0060 | 1.04                             | K <sub>2</sub> SO <sub>4</sub> ..... .0212  |
| Ca..... .1329                              | 23.15                            | Na <sub>2</sub> SO <sub>4</sub> ..... .0278 |
| Mg..... .0351                              | 6.13                             | CaSO <sub>4</sub> ..... .1401               |
| Na..... .0090                              | 1.57                             | CaCO <sub>3</sub> ..... .2272               |
| K..... .0127                               | 2.21                             | MgCO <sub>3</sub> ..... .1228               |
| ..... .3515                                |                                  | ..... .5747                                 |
| CO <sub>2</sub> ..... .2225                | 38.77                            | Total, 100.12 per cent.                     |
| ..... .5740                                | 100.00                           |                                             |

E.—*"Sulphur" bath.*

[Total solids: 0.5775 gramme to the liter.]

| Found.                                     | Per cent.<br>of total<br>solids. | Probable combination.                       |
|--------------------------------------------|----------------------------------|---------------------------------------------|
| SiO <sub>2</sub> ..... .0230               | 3.98                             | SiO <sub>2</sub> ..... .0230                |
| SO <sub>4</sub> ..... .1273                | 22.04                            | Al <sub>2</sub> O <sub>3</sub> ..... .0065  |
| Cl..... .0032                              | 0.55                             | KCl..... .0068                              |
| Al <sub>2</sub> O <sub>3</sub> ..... .0065 | 1.13                             | K <sub>2</sub> SO <sub>4</sub> ..... .0158  |
| Ca..... .1318                              | 22.82                            | Na <sub>2</sub> SO <sub>4</sub> ..... .0420 |
| Mg..... .0330                              | 5.71                             | CaSO <sub>4</sub> ..... .1278               |
| Na..... .0136                              | 2.36                             | CaCO <sub>3</sub> ..... .2355               |
| K..... .0107                               | 1.85                             | MgCO <sub>3</sub> ..... .1155               |
| ..... .3491                                |                                  | ..... .5729                                 |
| CO <sub>2</sub> ..... .2284                | 39.56                            | 99.20 per cent. accounted for.              |
| ..... .5775                                | 100.00                           |                                             |

No  $H_2S$  nor sulphides were found in this water. The spring, however, is said to have at times a "sulphur odor."

F.—*Magnesian spring.*

[Total solids; 0.3825 gramme to the liter.]

| Found.                      | Per cent.<br>of total<br>solids. | Probable combination.                      |
|-----------------------------|----------------------------------|--------------------------------------------|
| SiO <sub>2</sub> ..... 0120 | 3.14                             | Si O <sub>2</sub> ..... 0120               |
| O <sub>2</sub> ..... 0721   | 18.85                            | KCl..... 0042                              |
| Cl..... 0020                | 0.52                             | K <sub>2</sub> SO <sub>4</sub> ..... 0109  |
| Ca..... 0957                | 25.02                            | Na <sub>2</sub> SO <sub>4</sub> ..... 0201 |
| Mg..... 0209                | 5.46                             | CaSO <sub>4</sub> ..... 0744               |
| Na..... 0065                | 1.70                             | CaCO <sub>3</sub> ..... 1845               |
| K..... 0071                 | 1.85                             | MgCO <sub>3</sub> ..... 0731               |
| .....                       | .....                            | .....                                      |
| ..... 2163                  | .....                            | ..... 3792                                 |
| .....                       | .....                            | .....                                      |
| CO <sub>2</sub> ..... 1662  | 43.46                            | 99.14 per cent. accounted for.             |
| .....                       | .....                            | .....                                      |
| ..... 3825                  | 100.00                           | .....                                      |

Why this spring is specially named "Magnesian" is not explained. It will be noted that this spring, the coolest of the series, is proportionally richer in carbonates and poorer in sulphates than the others. This relation is shown by a comparison of the percentage columns.



**THE ESTIMATION OF ALKALIES IN SILICATES, BY  
THOMAS M. CHATARD.**

Walter Hempel proposed (Fres. Zschr. 1881, p. 496) bismuth subnitrate as a means of decomposing silicates containing alkalies, and recommended the use of 20 parts of this salt (=10 parts of bismuth oxide) to one part of the silicate. In the *Berichte d. D. Chem. Gesellsch.*, 1881, there is an abstract of his paper, in which is proposed the use of bismuth oxide directly.

This process has been in use in this laboratory for the past six months, and, with some modifications, has given great satisfaction. Bismuth oxide has been used instead of the subnitrate, and experience has shown that, instead of ten parts, as stated above, *two parts* of oxide to *one part* of the mineral are ample in every case in which we have employed the method.

The oxide and mineral, both finely powdered, must be most thoroughly mixed, and then heated in a platinum crucible; applying at first a gentle heat and gradually increasing to full redness, which is kept up ten to fifteen minutes. In the case of an acid silicate, complete fusion may result, while the more basic the silicate the less fusible the mixture will be. Complete decomposition has been obtained when the resulting mass was so slightly sintered together as to fall on gentle pressure into powder, none of which adhered to the crucible. It has therefore been found advantageous, in dealing with acid silicates, to add to the mixture a quantity of calcium carbonate, in weight equal to that of the mineral. This device prevents the fusion which might hinder the after treatment with acid.

After the mass has been thoroughly heated to bright redness it is allowed to cool, placed in a dish, and hydrochloric acid somewhat diluted poured over it. On heating over the water bath the mass should go into solution rapidly, leaving no residue of undecomposed mineral, which is easily distinguishable from floating flakes of silica.

If complete analysis is required, evaporate to dryness and separate the silica, as in a soda fusion, afterwards removing the bismuth by sulphureted hydrogen. If only alkalies are to be determined, add ammonia and ammonium carbonate, filter, and separate magnesia from the alkalies by any of the usual methods.

The results of this process have been very satisfactory. Out of a large number of analyses the following duplicate has been selected as being sufficient to show the accuracy of the work. It may be remarked that in the case of this margarite (a very basic silicate) the mass was but slightly sintered together.

*Margarite.—Gainesville, Ga.*

1.0300 grammes gave 0.0440 alkali chlorides =  $0.0233 \text{ Na}_2\text{O}$  = 2.26 per cent.

1.0243 grammes gave 0.0435 alkali chlorides =  $0.0231 \text{ Na}_2\text{O}$  = 2.25 per cent.

(277)



# INDEX.

|                                                       | Page |
|-------------------------------------------------------|------|
| Abert Lake .....                                      | 28   |
| Alkalies in silicates, estimation of .....            | 36   |
| Allanite .....                                        | 10   |
| Alum rock .....                                       | 13   |
| Alunogen .....                                        | 13   |
| Basalt from Mount Thielson .....                      | 15   |
| Basalt from Pit River .....                           | 16   |
| Bear River .....                                      | 30   |
| Beryl .....                                           | 11   |
| Boiling Spring, Honey Lake Valley, California .....   | 28   |
| Cimolite .....                                        | 12   |
| City Creek .....                                      | 29   |
| Clays from Mill City, Nevada .....                    | 15   |
| Coal from Cranston, Rhode Island .....                | 18   |
| Dacites from Lassen's Peak .....                      | 16   |
| Damourite .....                                       | 11   |
| Emigrant Gulch, Warm Springs .....                    | 31   |
| Fulgurite .....                                       | 16   |
| Gahnite .....                                         | 9    |
| Halloysite .....                                      | 12   |
| Halotrichite .....                                    | 14   |
| Helena Hot Springs .....                              | 32   |
| High Rock Spring, Honey Lake Valley, California ..... | 28   |
| Hot Spring, Hot Spring Station, Nevada .....          | 24   |
| Hot Spring, foot of Granite Mountain, Nevada .....    | 24   |
| Humboldt River .....                                  | 23   |
| Inclusion in dacite .....                             | 16   |
| Jade .....                                            | 9    |
| Lahontan beds, powder from .....                      | 14   |
| Limestones, West Virginia .....                       | 17   |
| Limonite .....                                        | 18   |
| Livingston Warm Springs .....                         | 31   |
| Lower Hot Spring, Honey Lake Valley, California ..... | 28   |
| Magnetite, from Montana .....                         | 17   |
| Margarite .....                                       | 11   |
| Marl from Nevada .....                                | 14   |
| Mill Creek Cold Spring .....                          | 32   |
| Mono Lake .....                                       | 26   |
| Obsidian, scoriaceous .....                           | 14   |
| Pectolite .....                                       | 9    |
| Petroleum Spring, Mono Lake .....                     | 27   |
| Prochlorite .....                                     | 13   |
| Pyramid Lake .....                                    | 19   |
| Saundersite .....                                     | 10   |
| Scoriaceous obsidian .....                            | 14   |
| Silicates, estimation of alkalies in .....            | 36   |

|                                       | Page |
|---------------------------------------|------|
| Soda lakes .....                      | 26   |
| Tahoe, Lake .....                     | 28   |
| Tufa Crag, Mono Lake, spring on ..... | 27   |
| Utah Hot springs .....                | 30   |
| Utah Lake .....                       | 29   |
| Virginia Hot Springs .....            | 33   |
| Walker Lake .....                     | 22   |
| Walker River .....                    | 23   |
| Warm Springs, Emigrant Gulch .....    | 31   |
| Warm Springs, Mono Basin .....        | 27   |
| Winnemucca Lake .....                 | 21   |

(280)

O

## ADVERTISEMENT.

(Bulletin No. 10.)

The publications of the United States Geological Survey are issued in accordance with the statute, approved March 3, 1879, which declares that—

"The publications of the Geological Survey shall consist of the annual report of operations, geological and economic maps illustrating the resources and classifications of the lands and reports upon general and economic geology and paleontology. The annual report of operations of the Geological Survey shall accompany the annual report of the Secretary of the Interior. All special memoirs and reports of said Survey shall be issued in uniform quarto series if deemed necessary by the director, but otherwise in ordinary octavos. Three thousand copies of each shall be published for scientific exchanges and for sale at the price of publication; and all literary and cartographic materials received in exchange shall be the property of the United States and form a part of the library of the organization: And the money resulting from the sale of such publications shall be covered into the Treasury of the United States."

On July 7, 1882, the following joint resolution, referring to all Government publications, was passed by Congress:

That whenever any document or report shall be ordered printed by Congress, there shall be printed in addition to the number in each case stated, the "usual number" [1,900] of copies for binding and distribution among those entitled to receive them.

Under these general laws it will be seen that none of the survey publications are furnished to it for gratuitous distribution. The 3,000 copies of the annual report are distributed through the document rooms of Congress. The 1,900 copies of each of the publications are distributed to the officers of the legislative and executive departments and to stated depositories throughout the United States.

Except, therefore, in those cases where an extra number of any publication is supplied to this office by special resolution of Congress, as has been done in the case of the second, third, fourth, and fifth annual reports, or where a number has been ordered for its use by the Secretary of the Interior, as in the case of Williams's Mineral Resources, the survey has no copies of any of its publications for gratuitous distribution.

### ANNUAL REPORTS.

Of the Annual Reports there have been already published:

I. First Annual Report to the Hon. Carl Schurz, by Clarence King. 1880. 8°. 79 pp. 1 map.—A. preliminary report describing plan of organization and publications.

II. Report of the Director of the United States Geological Survey for 1880-'81, by J. W. Powell. 1882. 8°. lv, 588 pp. 61 pl. 1 map.

III. Third Annual Report of the United States Geological Survey, 1881-'82, by J. W. Powell. 1883. 8°. xviii, 564 pp. 67 pl. and maps.

IV. Fourth Annual Report of the United States Geological Survey, 1882-'83, by J. W. Powell. 1884. 8°. xii, 478 pp. 85 pl. and maps.

The Fifth Annual Report is in press.

### MONOGRAPHS.

So far as already determined upon, the list of the Monographs is as follows:

I. The Precious Metals, by Clarence King. In preparation.

II. Tertiary History of the Grand Cañon District, with atlas, by Capt. C. E. Dutton. Published.

III. Geology of the Comstock Lode and Washoe District, with atlas, by George F. Becker. Published.

IV. Comstock Mining and Miners, by Eliot Lord. Published.

V. Copper-bearing Rocks of Lake Superior, by Prof. R. D. Irving. Published.

VI. Older Mesozoic Flora of Virginia, by Prof. Wm. M. Fontaine. Published.

VII. Silver-lead Deposits of Eureka, Nevada, by Joseph S. Curtis. Published.

VIII. Paleontology of the Eureka District, Nevada, by Charles D. Walcott. In press.

IX. Brachiopoda and Lamellibranchiata of the Green Marls and Clays of New Jersey, by R. P. Whitfield.

## ADVERTISEMENT.

Geology and Mining Industry of Leadville, with atlas, by S. F. Emmons. In preparation.  
 Geology of the Eureka Mining District, Nevada, with atlas, by Arnold Hague. In preparation.  
 Lake Bonneville, by G. K. Gilbert. In preparation.  
 Dinocerata. A Monograph on an extinct order of Ungulates, by Prof. O. C. Marsh. In preparation.  
 Sauroptoda, by Prof. O. C. Marsh. In preparation.  
 Stegosauria, by Prof. O. C. Marsh. In preparation.  
 Of these Monographs, Nos. II, III, IV, V, VI, and VII are now published, viz:  
 II. Tertiary History of the Grand Cañon District, with atlas, by C. E. Dutton, Capt. U. S. A. 1882.  
 4°. 264 pp. 42 pl. and atlas of 26 double sheets folio. Price \$10.12.  
 III. Geology of the Comstock Lode and Washoe District, with atlas, by G. F. Becker. 1882. 4°. xv, 423 pp. 7 pl. and atlas of 21 sheets folio. Price \$11.  
 IV. Comstock Mining and Miners, by Elliot Lord. 1882. 4°. xiv, 451 pp. 8 pl. Price \$1.50.  
 V. Copper-bearing Rocks of Lake Superior, by Prof. R. D. Irving. 1883. 4°. xvi, 464 pp. 28 pl. Price \$—.  
 VI. Contributions to the Knowledge of the Older Mesozoic Flora of Virginia, by Wm. M. Fontaine. 1883. 4°. xi, 144 pp. 54 l. 54 pl. Price \$—.  
 VII. Silver-lead Deposits of Eureka, Nevada, by Joseph S. Curtis. 1884. 4°. xiii, 200 pp. 15 pl. Price \$—.  
 Nos. VIII and IX are in press and will soon appear. The others, to which numbers are not assigned, are in preparation.

## BULLETINS.

The Bulletins of the Survey will contain such papers relating to the general purpose of its work as do not properly come under the heads of ANNUAL REPORTS or MONOGRAPHS.

Each of these Bulletins will contain but one paper, and be complete in itself. They will, however, be numbered in a continuous series, and will in time be united into volumes of convenient size. To facilitate this, each Bulletin will have two paginations, one proper to itself, and one which belongs to it as part of the volume.

Of this series of Bulletins Nos. 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10 are already published:

1. On Hypersthene-Andesite and on Triclinic Pyroxene in Angitic Rocks, by Whitman Cross, with a Geological Sketch of Buffalo Peaks, Colorado, by S. F. Emmons. 1883. 8°. 42 pp. 2 pl. Price 10 cents.
2. Gold and Silver Conversion Tables, giving the coining value of Troy ounces of fine metal, &c., by Albert Williams, jr. 1883. 8°. ii, 8 pp. Price 5 cents.
3. On the Fossil Faunas of the Upper Devonian along the meridian of 76° 30', from Tompkins County, N. Y., to Bradford County, Pa., by Henry S. Williams. 1884. 8°. 36 pp. Price 5 cents.
4. On Mesozoic Fossils, by Charles A. White. 1884. 8°. 36 pp. 9 pl. Price 5 cents.
5. A Dictionary of Altitudes in the United States, compiled by Henry Gannett. 1884. 8°. 325 pp. Price 20 cents.
6. Elevations in the Dominion of Canada, by J. W. Spencer. 1884. 8°. 43 pp. Price 5 cents.
7. Mapoteca Geologica Americana. A catalogue of geographical maps of America (North and South), 1752-1881, by Jules Marcou and John Belknap Marcon. 1884. 8°. 184 pp. Price — cents.
8. On Secondary Enlargements of Mineral Fragments in Certain Rocks, by R. D. Irving and C. R. Vanhise. 1884. 8°. 56 pp. Price 10 cents.
9. A Report of the Work done in the Washington Laboratory during the fiscal year 1883-'84. F. W. Clarke, chief chemist; T. M. Chatard, assistant. 1884. 8°. 40 pp. Price 5 cents.
10. On the Cambrian Faunas of North America. Preliminary studies by Charles Doolittle Walcott. 1884. 8°. 74 pp. Price 5 cents.

## STATISTICAL PAPERS.

A fourth series of publications having special reference to the mineral resources of the United States is contemplated. Of that series the first has been published, viz: Mineral Resources of the United States, by Albert Williams, jr. 1883. 8°. xvii, 813 pp. Price 50 cents.

Correspondence relating to the publications of the Survey, and all remittances, which must be by postal note or money order, should be addressed to the

DIRECTOR OF THE UNITED STATES GEOLOGICAL SURVEY,  
 Washington, D. C.

WASHINGTON, D. C., August 31, 1884.

DEPARTMENT OF THE INTERIOR

---

BULLETIN

OF THE

UNITED STATES

GEOLOGICAL SURVEY

No. 10



WASHINGTON  
GOVERNMENT PRINTING OFFICE  
1884





UNITED STATES GEOLOGICAL SURVEY

J. W. POWELL DIRECTOR

---

ON

THE CAMBRIAN FAUNAS

OF

NORTH AMERICA

PRELIMINARY STUDIES

BY

CHARLES DOOLITTLE WALCOTT



WASHINGTON  
GOVERNMENT PRINTING OFFICE  
1884



DEPARTMENT OF THE INTERIOR,  
UNITED STATES GEOLOGICAL SURVEY,  
*Washington D. C., July 1, 1884.*

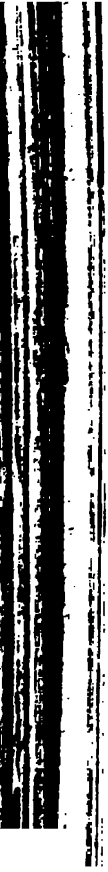
SIR: Herewith I have the honor to transmit the first of my preliminary studies on the Cambrian Faunas of North America.

The faunas studied are under discussion at the present time, and an early publication is desirable.

Very respectfully,

CHARLES D. WALCOTT.

Hon. J. W. POWELL,  
*Director U. S. Geological Survey.*



## CONTENTS.

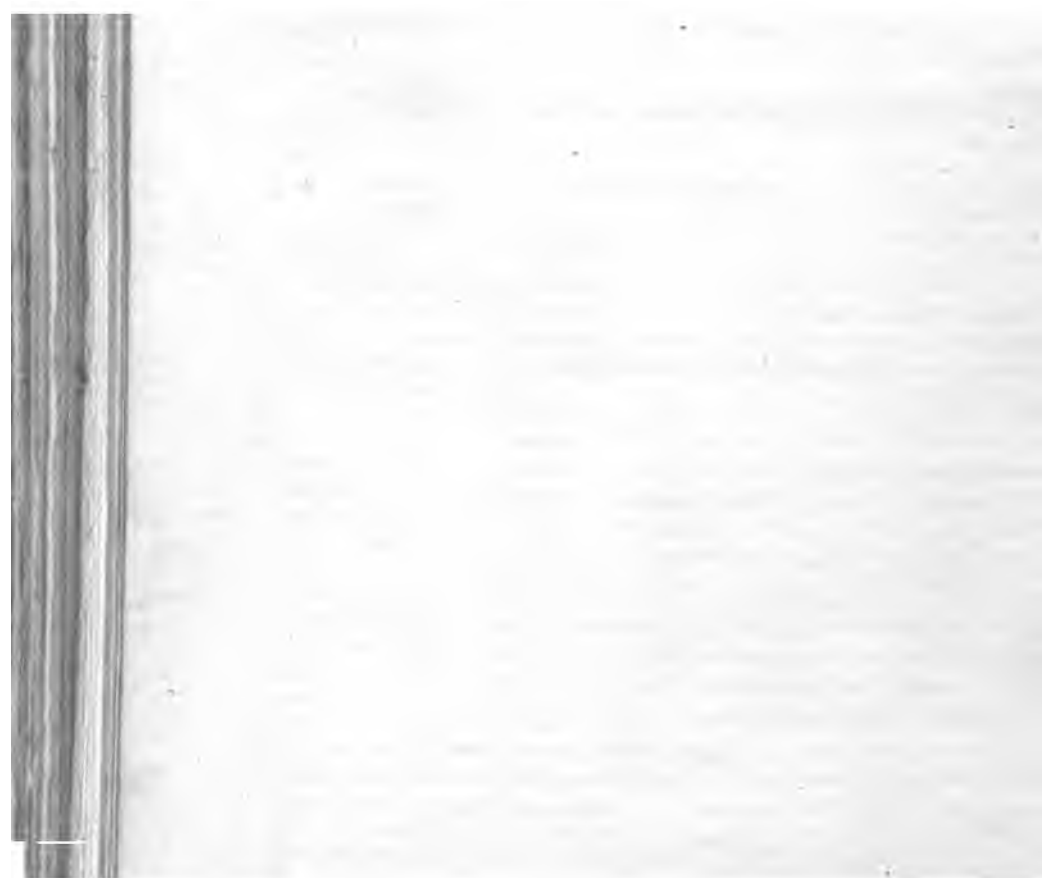
---

|                                                                                             | Page. |
|---------------------------------------------------------------------------------------------|-------|
| I.—Letter of transmittal.....                                                               | 5     |
| II.—Review of the fauna of the Saint John formation, contained in the Hartt collection..... | 9     |
| III.—Fauna of the Braintree argillites.....                                                 | 43    |
| IV.—On a new genus and species of Phyllopoda from the Middle Cambrian....                   | 50    |

## ILLUSTRATIONS.

---

| PLATE                                           |  | Page |
|-------------------------------------------------|--|------|
| I.—Fossils of the Saint John Formation .....    |  | 56   |
| II.—Fossils of the Saint John Formation .....   |  | 58   |
| III.—Fossils of the Saint John Formation .....  |  | 60   |
| IV.—Fossils of the Saint John Formation .....   |  | 62   |
| V.—Fossils of the Saint John Formation .....    |  | 64   |
| VI.—Fossils of the Saint John Formation .....   |  | 66   |
| VII.—Fossils of the Braintree Argillites .....  |  | 68   |
| VIII.—Fossils of the Braintree Argillites ..... |  | 70   |
| IX.—Fossils of the Braintree Argillites .....   |  | 72   |
| X.—New Phylloid crustacean.....                 |  | 74   |



# ON THE CAMBRIAN FAUNAS OF NORTH AMERICA.

## PRELIMINARY STUDIES.

By CHARLES D. WALCOTT.

### REVIEW OF THE FAUNA OF THE SAINT JOHN FORMATION CONTAINED IN THE HARTT COLLECTION AT CORNELL UNIVERSITY.<sup>1</sup>

During the summer of 1877 the writer visited Saint John, N. B., and taking advantage of information kindly given by Mr. G. F. Mat-

<sup>1</sup> The term "Saint John Group" was first proposed in 1865 (Observations on the Geology of Southern New Brunswick, Fredericton, N. B., pp. 26-32) by Messrs. L. W. Bailey, G. F. Matthew, and C. F. Hartt. Subsequently, Mr. J. W. Dawson (Acad. Geol., 2nd ed., p. 638, 1868) proposed to substitute the name Acadian for the same formation. He says: "This formation has as yet been known as the Saint John Group; but I think this name unsuitable, both on account of the number of places known as Saint John, and on account of the variety of formations occurring near Saint John, in New Brunswick, and would therefore propose for the group now under consideration, characterized by Paradoxides, Conocephalites, &c., and the oldest known member of the Palæozoic of America, the name Acadian Group, by which I hope it will be known to geologists in whatever part of America it may be recognized."

The geographic area bearing the name of Acadia is defined by Mr. Dawson (*Ibid.*, p. 5) as "distinguished from all the neighboring parts of America by the enormous and remarkable development within it of rocks of the Carboniferous and Triassic systems." This certainly renders the name inapplicable as a substitute for a well-defined local name previously given to the formation under consideration.

Saint John, N. B., is quite as well known as Trenton, New York, from which the well-known Trenton limestone is named. We would not give as a reason for changing that name that other towns in the United States bear the name of Trenton.

Mr. Matthew, in speaking of the Saint John formation, says (Trans. Roy. Soc. Canada, vol. i, p. 87, 1882): "From these reports and from the map it will be seen that the strata of the Saint John Group fill a number of narrow, trough-like basins lying between the Bay of Fundy and the central Carboniferous area of New Brunswick. Of these basins, that on which the city of Saint John is situated is the most important, and it is here, also that the life of the period can be studied to the best advantage. The Saint John basin lies diagonally across the ridges of Huronian rock that are found in the eastern part of Saint John County; and touches the ridge of Laurentian rocks that divides this county from Kings."

I cannot but think that if we pay attention to the law of priority, justice to the original discoverers of this group requires that the name of Saint John formation should be used as expressing the division of the Lower Cambrian, so well developed at Saint John.

The name Saint John or Acadian cannot well be applied to the Newfoundland or Braintree Paradoxides beds. The three localities present local differences and characters which, while permitting their being united under the general term Lower Cambrian, render it necessary to use a local name for the formation in each of the widely-separated localities.



thew, obtained a large collection of fossils from the typical localities at Saint John, Ratcliff's Millstream, and Portland, from which Mr. C. F. Hartt procured the collection described by him in the second edition of Dawson's *Acadian Geology*. Subsequently when working over the material, it was with great difficulty that more than the common species could be identified from the descriptions, and few figures given in the *Acadian Geology*. The writer at that time formed the plan of illustrating the original typical Hartt collection and also the entire fauna, as far as possible. His own collection afterward went to the Museum of Comparative Zoölogy at Cambridge, Mass., and it was not until the latter part of 1883 that the trustees of Cornell University came in possession of the Hartt collection. Through the co-operation of Mr. H. S. Williams, paleontologist of the university, the loan of the collection was obtained for the purpose of illustrating the type specimens and such other material as would add to our knowledge of the fauna. In writing to Mr. L. W. Bailey, of Fredericton, N. B., and Mr. G. F. Matthew, to secure their co-operation, the writer learned for the first time that Mr. Matthew was engaged on a monograph of the fauna of the Saint John formation. The plan of illustrating the entire fauna was at once changed so as to include only the Hartt collection, and Mr. Matthew was requested to propose specific names for the new species with the exception of one form with which the writer wished to connect the names of Mr. Hartt and Mr. Matthew, the two gentlemen who first gave to the scientific world a definite knowledge of this early Cambrian group. Mr. Matthew kindly accepted this proposal, and the writer proceeded with the work, using only the material contained in the Hartt collection.

Mr. Matthew's valuable paper on the genus *Paradoxides* of the Saint John Group, has already appeared (*Trans. Roy. Soc. Canada*, vol. i, 1882), and from it we learn that he recognizes three well-defined species and six varieties: *Paradoxides lamellatus*, Hartt; *P. lamellatus*, var. *Loricatus*, Matthew; *P. Acadicus*, Matthew; *P. Eteminicus*, Matthew; *P. Eteminicus*, vars. *suricoides*, *breviatus*, *Quacoensis*, *Malicitus* and *pontificalis*.

In the Hartt collection we find as the types of *P. lamellatus* a portion of the head of two specimens. The species appears to be of rare occurrence. Mr. Matthew illustrates but a fragment of the head of a specimen which he considers as indicating a variety of *P. lamellatus*.

Two other species occur in the collection that were not named by Mr. Hartt. *P. Acadicus*, Matt., is represented by the larger portion of an entire individual, and *P. Eteminicus*, Matt., by numerous fragments of the head. The *P. Micmac*, figured by Mr. Dawson (*Acad. Geol.* 2d ed., p. 657), is not represented in the collection, and Mr. Matthew writes me that the original specimens were destroyed in the great Saint John fire of 1877, and that he is unable to identify the species. The figure is a restoration, and no description accompanies it; on this account it ap-

appears best to drop the name from the list of species composing the Saint John fauna, as an undefined and undetermined species.

In reviewing the fauna as shown in the Hartt collection, we find the Echinodermata represented by single detached plates of one species, *Eocystites primævus*, Bill. A somewhat similar form occurs in the Menavian group of Wales, under the name of *Protocystites Menerensis*, Hicks.

Among the Brachiopods, *Lingula? Dawsoni*, Matt., *Acrothele Matthewi*, Hartt, *Obolella transversa*, Hartt., *Obolella*, sp., *Orthis Billingsi*, Hartt, and *Orthis*, sp. †, show how rich and varied this class must have been at the time of the deposition of the Saint John formation.

The new type representing the Gasteropoda, *Harttia Matthewi*, is of special interest owing to its being the oldest representative of the class known on the North American continent, and the section of the family which it approaches most nearly is doubtfully known, if at all, below the Tertiary system. The species *Palæacmea? Acadica*, is as yet doubtfully referred to the gasteropoda.

Of the Pteropoda there are three species, *Hyolithes Acadica*, Hartt, *H. Danianus*, Matt., and *H. Micmac*, Matt. The former is not unlike *H. primordialis*, Hall (Sixteenth Ann. Rep. N. Y. State Cab. Nat. Hist., p. 135\*), of the Potsdam sandstone of Wisconsin, and the second approaches *H. cinctus*, Barr. (Syst. Sil. Bohême, vol. iii, p. 78), of the Cambrian<sup>2</sup> of Bohemia.

The class Pœcilopoda, order Trilobita, is the dominant type in the Saint John fauna, as it is in all the known Cambrian faunas, and is represented by *Agnostus Acadicus*, Hartt; *Microdiscus Dawsoni*, Hartt, *M. punctatus*, Hartt; *Paradoxides lamellatus*, Hartt, *P. Acadicus*, Matt., *P. Eteminicus*, Matt.; and varieties *suricoides*, *breviatus*, *Malicitus*, *pontificalis* and *Quacoensis*; *Conocoryphe Matthewi*, Hartt, *C. elegans*, Hartt, *C. Walcotti*, Matt., *C. (Salteria) Baileyi*, Hartt; *Ptychoparia Robbi*, Hartt, *P. Ouangondiana*, Hartt, and variety *Aurora*; *P. quadrata*, Hartt, *P. Orestes*, Hartt, and variety *Thersites*, and *P. tener*, Hartt.

Mr. Hartt, described, in addition to these, *Conocephalites gemini-spinosus* = *Conocoryphe Matthewi*; *Conocephalites formosus* = *Ptychoparia Robbi*; *Conocephalites Aurora* = *Ptychoparia Ouangondiana*, variety *Aurora*; *Conocephalites Halli* = *Ptychoparia Orestes*; *Conocephalites Thersites* = *Ptychoparia Orestes*, variety *Thersites*; *Conocephalites neglectus* = *Ptychoparia tener*. It is with great reluctance that I reduce the above-named species to varieties and synonyms of other species, and it was not until after many comparisons and a study of all the material in the collection that it was done. Good figures are given of the types of each of Mr. Hartt's species, and the student has before him the original descriptions, so that he can judge for himself and not entirely rely upon the writer to form his opinion of the value of the species.

\* The Cambrian system, as referred to in this paper, is that series of strata characterized by the first fauna of Barrande.

In review we find 14 genera, 26 species, and 6 varieties, distributed as follows: Echinodermata, 1 genus, 1 species; Brachiopoda, 5 genera, 7 species; Gasteropoda, 1 genus, 1 species; Pteropoda, 1 genus, 3 species; Trilobita, 6 genera, 14 species, 6 varieties.

That Mr. Matthew's researches will increase this number of species there is little doubt, and it is not improbable that some of the species of Mr. Hartt which are placed in this paper as synonyms of some others may yet prove to be distinct.

Mr. Matthew states (Trans. Roy. Soc. Canada, vol. i, p. 89) that among the collections made by the Canadian Geological Survey in New Brunswick, Mr. Billings recognized fragments of the genera *Elliptocephalus* and *Salterella*, and the remains of two species of *Hyolithes*. "Besides these, there are the supposed plant remains, *Palæophycus*, *Eophyton*, etc., of the higher divisions of the Saint John Group."

While studying the species, the question of their correct generic reference came up, and a number of species of three different genera were found to be arranged under the genus *Conocephalites*, a genus that, with the greatest respect for the opinion of its author and his work, I cannot see the way clear to accept. The reasons for this will be found under remarks on the genus *Ptychoparia*. The new subgenus *Salteria* may be of doubtful subgeneric value, but with the characters of *C. (Salteria) venulosa*, Salter, before us, a subgeneric group, appears to be indicated.

The fauna of the Saint John Group has been most happily compared by authors with that of the *Paradoxides* fauna of Bohemia, Wales, and Sweden. The resemblance to that of the Menevian of Wales is very striking, and the relationship so close that we are in doubt if there are not more identical species than *Microdiscus punctatus* in the two faunas.

The more closely related species are:

| SAINT JOHN.                        | MENEVIAN.                       |
|------------------------------------|---------------------------------|
| <i>Obolella transversa</i> .....   | <i>Obolella sagittalis</i> .    |
| <i>Agnostus Acadicus</i> .....     | <i>Agnostus Cambrensis</i> .    |
| <i>Microdiscus punctatus</i> ..... | <i>Microdiscus punctatus</i> .  |
| <i>Conocoryphe Matthewi</i> .....  | <i>Conocoryphe Solvensis</i> .  |
| <i>Conocoryphe elegans</i> .....   | <i>Conocoryphe bufo</i> .       |
| <i>C. (Salteria) Baileyi</i> ..... | <i>C. (Salteria) venulosa</i> . |
| <i>Ptychoparia Robbi</i> ..        | <i>Ptychoparia applanata</i> .  |

A comparison with the Swedish *Paradoxides* fauna gives:

| SAINT JOHN.                       | SWEDISH.                      |
|-----------------------------------|-------------------------------|
| <i>Obolella transversa</i> .....  | <i>Obolella sagittalis</i> .  |
| <i>Agnostus Acadicus</i> ..       | <i>Agnostus brevifrons</i> .  |
| <i>Conocoryphe Matthewi</i> ..... | <i>Conocoryphe exsulans</i> . |
| <i>Conocoryphe elegans</i> .....  | <i>Conocoryphe Dalmani</i> .  |
| <i>Ptychoparia Robbi</i> .....    | <i>Ptychoparia cristata</i> . |

With the Bohemian Paradoxides fauna:

| SAINT JOHN.                       | BOHEMIAN.                      |
|-----------------------------------|--------------------------------|
| <i>Agnostus Acadicus</i> .....    | <i>Agnostus integer</i> .      |
| <i>Hyolithes Danianus</i> .....   | <i>Hyolithes cinctus</i> .     |
| <i>Conocoryphe Matthewi</i> ..... | <i>Conocoryphe coronatus</i> . |
| <i>Conocoryphe elegans</i> .....  | <i>Conocoryphe Sulzeri</i> .   |
| <i>Ptychoparia Robbi</i> .....    | <i>Ptychoparia Emmrichi</i> .  |

Mr. Matthew calls attention to the close interrelationship of the species of the Saint John Paradoxides and to the fact that they belong to a group characterized by a continuous eye-lobe, a feature developed in *Paradoxides rugulosus*, Corda (Syst. Sil. Bohême., vol. i, p. 374), of Bohemia. In the genus *Anopolenus* (Quar. Jour. Geol. Soc., vol. xxi, p. 177) the eye-lobes are continuous, but of a different character from the Saint John Paradoxides. *Olenellus asaphoides* (Amer. Jour. Sci., vol. xiii, p. 265) shows a continuous eye-lobe in some of the younger stages of development, a character not retained in the adult individual.

In comparing the Saint John fauna of Saint John with that of other localities of the Saint John fauna in North America, the first to be noted is that of Manuel's Brock, near Conception Bay, Newfoundland, as described by Mr. J. F. Whiteaves (Amer. Jour. Sci., 3d ser., vol. xvi, p. 224, 1878).

Mr. Whiteaves identifies of the Saint John fauna: *Agnostus Acadicus*, *Microdiscus Dawsoni*, *Microdiscus punctatus*, *Paradoxides*, sp. ? , *C. (Salteria) Baileyi*, *Ptychoparia tener*, *Ptychoparia Orestes* ?.

On the authority of Mr. Alex. Murray, the shales containing this fauna are considered by Mr. Whiteaves as lower than the strata from which Mr. Billings obtained a strongly-marked Cambrian fauna that he refers to the Menevian Group (Can. Nat., 2d ser., vol. vi, p. 470, 1872).

From this horizon Mr. Billings described *Obolella ? miser*, *Straparollina remota*, *Hyolithes excellens*, *Paradoxides tenellus*, *Paradoxides decorus*, *P. (Anopolenus) venustus*, *Agraulos affinis*, *A. socialis*, *A. strenuus*, *Ptychoparia (Solenopleura) communis*.

Mr. Billings also describes *Stenotheca pauper* and *Scenella reticulata*, from Conception Bay, the stratigraphic horizon being a little above the Manuel's Brook shales containing the Saint John fauna. To these we have to add the large *Paradoxides Bennetti*, Salter (Quart. Journ. Geol. Soc., vol. xv, p. 552, 1859), and *Bathyrurus = Solenopleura gregaria*, Billings (Pal. Foss., vol. i, p. 363, 1865), from the Paradoxides slates of Saint Mary's Bay, Newfoundland, which gives a total of fourteen described species from Paradoxides beds above the Saint John fauna.

From the sections given by Mr. Murray (Geol. Surv. Newfoundland, p. 157, 1881), we learn that the shales carrying the Saint John fauna are the lowest fossiliferous strata in Newfoundland, and that the Paradoxides beds above carry a fauna unlike the Saint John fauna. This proves the latter fauna to be the oldest known on the American continent, and when compared to the older Cambrian faunas of Wales, to

be low down in the Menevian if not representative of that of portions of the Harlech and Longmynd groups.

Near Saint John, N. B., there is a commingling of representative species that are distributed in the St. David's section of Wales, from the Harlech to the Upper Menevian, a fact that tells us plainly that we need not look for a close similarity in the succession of individual species in sections of the same relative geologic position when widely separated. The physical conditions of environment and the geographic distribution of species tend to variation in the assemblage of forms at localities but slightly separated, and still more when widely distant from each other.

In the Braintree argillites there are four species, *Hyolithes Shaleri*, Walcott (this bulletin), *Paradoxides Harlani*, Green (Amer. Journ. Sci., vol. xxv, p. 336, 1834), *Ptychoparia Rogersi*, Walcott (this bulletin), and *Agraulos quadrangularis*, Whitfield (Bull. Amer. Mus. Nat. Hist., vol. i, p. 147, 1884).

*Hyolithes Shaleri* is closely allied to *Hyolithes excellens*, Billings (Pal. Foss., vol. ii, pt. 1, p. 70, 1874).

The *Paradoxides Harlani* is of the type of *Paradoxides Bennetti*, of Newfoundland, as found above the Saint John fauna, and corresponds to the Bohemian group of the genus typified by *P. spinosus*, Boeck, and the Menevian *P. Hicksii*, Salter. *Agraulos quadrangularis*, Whitfield, is a type present in the *Paradoxides* horizon in Newfoundland, as *A. socialis*, *A. strenuus*, and *A. affinis*, Billings (Pal. Foss., vol. ii, pt. 1, p. 71), in the Menevian of Wales, as *A. longicephalus*, Hicks (Quar. Jour. Geol. Soc., vol. xxviii, p. 176), in Bohemia, as *A. ceticephalus*, Barrande (Syst. Sil. Bohême., vol. i, p. 405). *Ptychoparia Rogersi* is more of the type of *Ptychoparia Emmrichi*, Barrande, of Bohemia.

Up to the present time no other localities of the *Paradoxides* fauna have been discovered in North America.

The relations of the Saint John fauna to the remaining portion of the *Paradoxides* fauna in Newfoundland we have mentioned, but as yet no section has shown the connection of the *Paradoxides* fauna with that of the next superior or Georgian fauna. As I am engaged on a review of the latter fauna, the discussion will be omitted here to appear in a paper on that portion of the Cambrian fauna.

#### Genus EOCYSTITES, Billings.

#### EOCYSTITES PRIMÆVUS, Billings.

Plate i, fig. 2.

*Ecystites primævus*, Billings, 1868, Acadian Geology, Dawson, 2d ed., p. 643.

No description accompanies the illustration of the single plate of this form, and, in fact, little can be said of it from the material in the collection.

The plates are polygonal in outline, variable in size and form, elevated at the center, and ornamented by 9, 10, or 11 principal ridges radiating from the center with smaller ridges coming in between the larger ones, usually showing a pentagonal arrangement. The plates vary from 3 to 5 millimeters in diameter. It is quite probable that a new generic form is indicated, but in its relations to other genera nothing can be determined. *Protocystites Menevensis*, Hicks, evidently belongs to a similar type, if not to the same genus.

*Formation and locality*.—Cambrian. Saint John formation, Ratcliff's Millstream, N. B.

### Genus LINGULA, Bruguère.

#### LINGULA † DAWSONI, Matthew.

Plate v, fig. 8.

*Lingula † Dawsoni*, Matthew, 1884. MSS.

Shell small, broadly subelliptical, subattenuate towards the beak; margins gradually expanding and curving from the beak to the center, where the shell has its greatest width, and thence narrowing towards the front, which is broadly rounded. General surface depressed convex, becoming more convex towards the beak.

Surface marked by fine undulating concentric lines crossed by radiating lines that are seen only by the aid of a strong magnifying glass.

In form this species approaches *Lingulella ferruginea*, Salter (See *Man. Brit. Foss. Brach.*, Davidson, vol. iii, p. 336), of the Menevian formation of Wales quite closely, but with only a specimen of the ventral (!) valve to compare with it, it is difficult to satisfactorily determine its specific relations.

*Formation and locality*.—Cambrian. Saint John formation, Saint John, N. B.

The following notice of a larger shell than *Acrothele Matthewi* appears on page 644 of the *Acadian Geology* as a new species of *Lingula*:

"*Lingula*, n. sp., Hartt, differs from the above (*A. Matthewi*) in being almost straight in front, broadly rounded at the sides, and narrowed towards and pointed at the umbo. It was also larger, thicker, and more convex."

The original specimen I have failed to find in the collections, and no form corresponding to it has been observed.

### Genus ACROTHELE, Linnarsson.

#### ACROTHELE MATTHEWI, Hartt, sp.

Plate i, figs. 4, 4a.

*Lingula Matthewi*, Hartt, 1868, *Acadian Geology*, Dawson, 2d ed., p. 644, fig. 221.

*Description*.—"Dorsal valve, circular in outline or very slightly wider than long, extremely flat, the convexity being scarcely noticeable; shell

very thin; on each side a segment, such as would be cut off by a chord running from the umbo to the extremity of the transverse diameter, is slightly turned up on the margin.

"Inside, a strong mesial ridge, rounded and of moderate width, runs from the umbo to a point a little beyond the middle of the shell; at the umbo this ridge bears a small nailhead-like process or swelling, and there are two minute and extremely short secondary ridges, originating from the head of the primary, and extending obliquely backwards. Inner surface marked with numerous indistinct and irregular concentric striæ; outer surface not visible."

A study of the type specimen of this species, which is a cast of the interior of the dorsal valve, leads to its reference to the genus *Acrothele*, as it presents characters shown in a typical form of *Acrothele*, *A. subsidua*, White (Expl. and Surv. West 100th Merid., vol. iv, pt. 1, p. 34), from the Cambrian of Utah. On the list left by Professor Hartt, reference is made to specimen No. 342 as *Obolus (Discina) nitidus*, sp. nov. This specimen presents the characters of a ventral valve of *Acrothele*, and is of the form that the ventral valve of *A. Matthewi* would probably have, and although not associated with it at Saint John, I have little hesitancy in referring to it as the ventral valve of *A. Matthewi*. It is illustrated on plate i, fig. 4a.

*Formation and locality*.—Cambrian. Saint John formation, Saint John and Ratcliff's Millstream, N. B.

#### Genus OBOLELLA, Billings.

#### OBOLELLA TRANSVERSA, Hartt.

Plate i, figs. 5, 5a.

*Obolella transversa*, Hartt, 1868, *Acadian Geology*, Dawson, 2d ed., p. 644.)

"A very small, transversely oval species, from Coldbrook, Saint John."

The above is all the description by the author of the species and no figure is given, but, with the typical material used by him before me, there is little difficulty in recognizing the species.

It is closely allied to *Obolella sagittalis*, Salter, and Mr. Davidson's description of that species (*Geol. Mag.*, vol. v, p. 309, 1868) reads as though it were drawn from the Saint John specimens. Figures are given of the interiors of the two valves.

*Obolella? miser*, Billings (*Pal. Fos.* vol. ii, pt. 1, p. 69, 1874), is a closely allied species from the Saint John formation horizon. No figures accompany the description.

*Formation and locality*.—Cambrian. Saint John formation, Coldbrook, Saint John, N. B.

#### OBOLELLA, sp. undt.

What appears to be a second species occurs with the preceding. The form is more elongate, the surface is concentrically striated with fine

lines, and the interior appears to be less strongly marked by the muscular scars.

Genus ORTHIS, Dalman.

ORTHIS BILLINGSI, Hartt.

Plate i, figs. 1, 1b-d.

*Orthis Billingsi*, Hartt, 1868, *Acadian Geology*, Dawson, 2d ed., p. 644, fig. 223.

*Description*.—"Shell subquadrate to semicircular, broader than long; greatest width at the hinge-line; moderately convex; greatest thickness at about the middle; depressed in front. Hinge-line straight. Dorsal valve semicircular or subquadrate; depressed, with a shallow sinus running from the umbo to the front. Umbo not elevated above the hinge-area, which is very narrow, and marked by fine, parallel longitudinal striæ. Hinge-plate bearing two slight incurved internal processes. Ventral valve more arched than the dorsal, with a narrow, flat margin produced in the plane of the valve. Hinge-area triangular, concave, and marked with fine parallel lines. Umbo elevated above hinge-line about one-fourth of length of shell. Foramen triangular and of moderate size. Surface ornamented by about thirty prominent rounded, radiating plicæ, increasing in width towards the margin, becoming less elevated and slightly curved toward the ears, crossed by a number of distinctly marked, concentric, squamose lines of growth, and numerous fine concentric striæ. The radiating plicæ increase by bifurcation, which takes place at about one-third the distance from the umbo to the margin."

The figure accompanying the above description is that of a rather transverse ventral valve, on which the radiating costæ are unusually strong. They also bifurcate in a manner observed in but one other specimen in the collection. At first sight this shell will be separated as a distinct species from the variety, having sharp, somewhat distant ribs radiating from the beak, with finer ribs appearing between them on the cast, but other specimens occur where the two surface characters are shown on the same shell, and give the impression that we have a single variable species, the two extremes of which are shown in our figures 1, 1d, of plate i. The crowding together of the increased number of ribs on the costate variety gives the bifurcating character to the ribs or costæ.

The ventral valve of *O. Billingsi* is little elevated, in this respect being unlike other Cambrian species, and there does not appear to be any nearly-related species of *Orthis* in strata of Cambrian age. *Orthis Hicksi*, Salter (see Davidson's *Mou. Brit. Foss. Brach.*, vol. iii, p. 230), is the prevailing form in the Menevian of Wales, and in some of



its phases resembles *O. Billingsi*. Among the Swedish forms the latter may be compared with *O. exporecta*, Linnarsson (Bihang till K. Svenska Vet. Akad. Handlingar. Band. 3, N:o. 12, p. 12, 1876).

*Formation and locality*.—Cambrian. Saint John formation, Ratcliff's Millstream and Saint John, N. B.

*ORTHIS*, sp. ?

Plate i, fig. 1a.

Associated with the preceding at Saint John, there is a small single dorsal (?) valve of a species of *Orthis* that appears to be distinct from *O. Billingsi*. A moderately well-defined median sinus is shown and the surface, as preserved in the cast, was somewhat finely ribbed. Professor Hartt refers to a new species of *Orthis* as not being sufficiently well represented to warrant its description, but gives another specimen, fig. 1c, plate i, as the form. This I consider as a variety of *O. Billingsi*, and the shell under consideration may only have the same position when a larger series comes to be studied.

Genus *HARTTIA*, n. gen.

This generic name is proposed for a unique little shell found in association with fragments of trilobites of the genera *Paradoxides* and *Ptychoparia*.

*Description*.—A small, oval, patelliform shell, having a low, broad ridge originating on the posterior (?) side of the interior that supports a subcordate shield-like expansion which extends out over the anterior (?) portion of the interior when we look down into the shell. The broad base of the ridge and the general character of the shield-like extension are well shown in the figure on plate i, fig. 3.

The character of the apex is unknown, as the only representation of the genus and species is in the form of a cast, showing the interior of the central portion and, around the margins, the cast of the apparently smooth outer surface.

The interior ridge and shield-like expansion is of a peculiar character, and unlike that of any described recent or fossil form known to me. It is so well marked that there is little hesitancy in proposing a new genus for its reception. The genus may be included in the *Calyptræidæ* nearest the genus *Crepidula*, if we compare the shield-like expansion with the shelf or shelly partition of *Crepidula*. However close or distant its relations to the latter, it certainly appears to be the representative of the *Calyptræidæ* type in the Cambrian, and adds another form, showing the differentiation of the invertebrate fauna in the oldest fauna yet known on the American continent.

The generic name is in honor of Mr. C. F. Hartt. With it I wish to

associate that of Mr. G. F. Matthew, the discoverer of the Cambrian age of the Saint John formation.

*HARTTIA MATTHEWI*, n. sp.

Plate i, fig. 3.

The characters of this species have already been given under the description of the genus.

The base of the shell, as shown in the specimen, measures 2.5<sup>mm</sup> by 3.5<sup>mm</sup>. It was probably a little larger, as the true margin is not to a certainty clearly shown.

There is no reference or record number attached to the specimen, and nothing is said of it in Mr. Hartt's notes as published by Mr. Dawson. A scratched outline around the specimen shows that it had been noticed, but whether by one of the collectors of the specimens or by Mr. Hartt is unknown.

*Formation and locality*.—Cambrian. Saint John formation. The character of the slate and the embedded fossils is similar to that of the material from Ratcliff's Millstream, and it was associated in the collection with specimens from that locality.

Genus *PALÆACMEA*, H. & W.

*PALÆACMEA* ? *ACADICA*, Hartt.

Plate i, fig. 6.

*Discina Acadica*, Hartt, 1868, *Acadian Geology*, Dawson, 2d ed., p. 644, Fig. 222.

*Description*.—"Shell elliptical in outline; sides more or less straight. Conical, but very depressed. Apex apparently central. Surface marked with a number of deep, concentric, irregular, sharp furrows, not always continuous, and often breaking up into smaller grooves, and all these seem at times to be impressed with lighter lines running nearly parallel with them. Of the large furrows from nine to ten can usually be counted. The whole surface of the shell is marked with a great number of delicate raised lines radiating from the summit to the circumference, and just visible to the naked eye."

An examination of several specimens of this species, including the types, leads me to think with Mr. R. P. Whitfield (*Bull. Amer. Mus. Nat. Hist.*, vol. i, p. 141, 1884), that it is not a true *Discina*, but probably a univalve shell, allied to *Palæacmea* or *Stenotheca*. The material in the collection is very poor and fragmentary; so much so that the generic reference is to be considered as merely provisional.

*Formation and locality*.—Cambrian. Saint John formation, Ratcliff's Millstream, N. B.

## Genus HYOLITHES, Eichwald.

## HYOLITHES ACADICA, Hartt.

Plate ii, fig. 5.

*Theca Acadica*, Hartt. Label on specimen.

Form an elongate triangular pyramid, tapering gradually and uniformly to an acute extremity. Transverse section subtriangular, about twice as wide as high; the lateral angles acute from compression in the specimens in the collection. Ventral face slightly arched; anterior margin extending forward in a semicircular subspatulate extension. Dorsal surface rather strongly convex. Aperture unknown, but undoubtedly oblique, judging from the character of the extension of the ventral side.

Operculum unknown.

Surface of shell marked by concentric lines of growth, parallel to the margin of the aperture, and exceedingly fine longitudinal striae visible only by the aid of a strong magnifier.

In general form this species approaches very closely to *Hyolithes Americanus*, Billings (Can. Nat. n. ser., vol. vi, p. 215, 1872), but equally so to the Devonian *H. acilis*, Hall (Pal. N. Y., vol. v, pt. 2, p. 197,) except in the more rounded dorsal side.

Owing to the imperfect condition of preservation of the species illustrated from the Menevian group of Wales, it is difficult to make comparisons with them. Professor Hartt's specific name is retained, as the probabilities are that the form is different from the American Potsdam and Georgian species, although allied to *H. primordialis*, Hall (Sixteenth Ann. Rep. State Cab. Nat. Hist., p. 135,\* 1863), and also the Menevian forms of the genus in Wales.

*Formation and locality*.—Cambrian. Saint John formation, Ratcliff's Millstream, N. B.

## HYOLITHES DANIANUS, Matthews.

Plate ii, figs. 7, 7a, b.

*Hyolithes Danianus*, Matthews, 1884, MSS.

Form that of an extremely elongate rounded subtriangular pyramid that, in some examples, curves a little to one side as it becomes gradually attenuate towards the apex. Transverse section semielliptical; moderately convex on the ventral side and still more so on the dorsal. Ventral face flattened and almost concave along the center, rounding up on each side to the somewhat rounder lateral angles. Dorsal face not very strongly convex transversely. Form of aperture unknown.

Associated operculum broad oval, or subcircular in general form. The side corresponding to the ventral side of the shell curves regularly, but is not as convex as the opposite side. The umbo is situated

about four-fifths the distance from the dorsal margin, and extends laterally as a low, rounded ridge towards the rounded angles formed by the union of the ventral and dorsal sides of the operculum; just in front of these ridges a slight depression exists, also a depressed area back of the umbo, or towards the dorsal margin; the inner side shows a sharp ridge corresponding to the umbonal ridges on the outside, and also a sharp, short, elevated ridge between the ventral margin and the position of the umbo on the outer surface. The general body of the shell of the operculum appears to have been quite thin.

Surface of the shell marked by transverse, concentric undulations of growth that arch slightly forward on the ventral side. Outer surface of the operculum marked by fine concentric striæ and very fine, somewhat obscure, radiating striæ; inner surface with fine, slightly irregular, radiating lines or striæ.

There is considerable range of variation in the form of the shells of this species. In some the flattening of the ventral side is lost, and only a convex surface is shown, and the dorsal surface has a narrow longitudinal line on each side of the center. The curvature of the shell also varies considerably. A number of specimens of the operculum are associated with the shells, but none were observed attached before the mouth of the shell.

One unusually curved shell having a nearly round section, was labeled *Orthoceras*? n. sp., by Professor Hartt, as traces of what appear to be septa are shown. The distances between the septa-like partitions are unequal, and in other specimens this is seen to be owing to the filling of cracks across the tube.

This species recalls *Hyolithes cinctus*, Barrande (Syst. Sil. Bohême., vol. iii, plate ix, figs. 8-12), and the form of the associated operculum is also similar.

*Formation and locality*.—Cambrian. Saint John formation, Ratcliff's Millstream, N. B.

#### HYOLITHES MICMAC, Matthew.

Plate ii, fig. 6.

*Hyolithes Micmac*, Matthew, 1884, MSS.

Form that of an extremely elongate, rounded, subtriangular pyramid that becomes gradually attenuate towards the apex. The true transverse section is not preserved, owing to the crushing down of the shell, and appears to have been semielliptical or rounded subtriangular.

Form of aperture and operculum unknown.

Surface of the shell smooth externally; the interior is marked by fine, raised, longitudinal lines.

In form this species is not unlike *Hyolithes Danianus*, but the smooth outer surface and striated inner surface distinguishes it from that and also any other described species known to me.

Dimensions: Length of specimen 20<sup>mm</sup>, width at aperture 4<sup>mm</sup>.

*Formation and locality.*—Cambrian. Saint John formation, associated with *Microdiscus punctatus* at Ratcliff's Millstream, N. B.

Genus AGNOSTUS, Brongniart.

AGNOSTUS ACADICUS, Hartt.

Plate ii, figs. 2, 2a-c.

*Agnostus Acadicus*, Hartt, 1868, Acadian Geology, Dawson, 2d ed., p. 655.

*Agnostus similis*, Hartt, 1868, Acadian Geology, Dawson, 2d ed., p. 656.

*Description.*—"Head minute, transversely-elliptical, or subcircular; breadth and length about equal, convex but very depressed, outlines in front and on the sides slightly straightened. A narrow, flattened, and but very slightly elevated border goes round the front and lateral margins. This is separated from rest of shield by a narrow, shallow, flat space, or groove, which, on going posteriorly along the lateral margins, loses gradually in width toward the posterior angles of shield, which are rounded. Glabella a little less than two-thirds the length of shield, long elliptical, depressed convex, but more elevated than other parts of the shield, about twice as long as broad, bounded anteriorly and laterally by a sharp, rather deep groove concentric to the outer one above described. A well-marked transverse furrow, arching backwards, separates the anterior third of the glabella as a subcircular lobe. Posterior part of glabella rounded, but impressed on each side by a little lobe situated in the angle between the cheek-lobe and the glabella. These little lobes are about one-quarter the size of the anterior glabellar lobe. Cheeks of the same width throughout, and uniting in front of the glabella, being bounded by the two concentric grooves above mentioned. Posteriorly they are rounded; in width they are rather greater than the glabella. They are convex, more elevated along their inner margin, but sloping outward roundly and evenly. Glabella with its lobes project considerably beyond posterior margin. Surface smooth. Pygidium of this species (?) of about the same outline as cephalic shield. The posterior and lateral margins have a slight, raised border, separated from lateral lobes by a shallow but well-marked groove running parallel to the margin. This groove widens at the point where it bends to go forward along the sides in such a way as to encroach on and thin out the marginal fold, and, just before reaching the anterior margin, it narrows itself from the inner side so as to cause the lateral lobes to widen somewhat anteriorly. These are narrow, flattened, about half as wide as the middle lobe, narrowing to a point just behind the middle lobe, where they do not unite. The medial lobe is about five-sixths of length of pygidium, shield-shaped, flattened, convex, more elevated than the lateral lobe. Its anterior border is slightly concave in the middle. The lateral angles are rounded, and the lobe is contracted a little an-

teriorly. It is bounded by two deep and well-marked furrows, which join one another in the middle of the marginal furrow, forming a pointed arch. Medial lobe projecting farther forwards than the lateral ones. A little spine is situated on its mesial line about one-fourth its length from front. Surface smooth."

After a careful study of all the specimens in the collection, fifteen in number, I am unable to make out sufficient differences between the form described as *A. Acadicus* and that given as *A. similis*, to establish two species. There is a certain range of variation in the specimens as pointed out by Mr. Hartt, but that is so variable and owes its origin so largely to the condition of preservation of the various specimens that it is not evident that two species are typified.

*Agnostus Acadicus* is a type of the genus that occurs in the Menevian of Wales, as *A. Cambrensis*, Hicks (Quart. Jour. Geol. Soc., vol. xxvii, p. 400, 1871); in Norway, as *A. brevifrons*, Angelin (Pal. Scan., p. 6, 1852); in Bohemia as *A. integer*, Beyr. (Sil. Syst. Bohême., vol. i, p. 900, 1852); and in the American Potsdam horizon as *A. Neon*, Hall & Whitfield (Geol. Expl. 40th Par., vol. iv, p. 229, 1877). *Agnostus interstrictus*, White (Expl. and Surv., West 100th Merid., vol. iv, p. 38), from the Cambrian of Utah, is an almost identical species, differing principally in the postero-lateral angles of the pygidium.

*Formation and locality*.—Cambrian, Saint John formation, Saint John, N. B.

#### Genus MICRODISCUS, Emmons.

##### MICRODISCUS DAWSONI, Hartt.

Plate ii, figs. 3, 3a.

*Microdiscus Dawsoni*, Hartt, 1868. Acadian Geology, Dawson, 2d ed., p. 654.

*Description*.—"Cephalic shield semi-lunar, with thickened border crossed by numerous grooves running perpendicularly to the circumference. Glabella convex, narrow, rounded in front, conical and pointed behind, projecting beyond posterior border, without furrows or occipital groove. Cheeks convex, no eyes, and no traces of sutures. Posterior angles of shield with backward projecting spines. Pygidium subtriangular, with curved outlines, rounded in front and behind; middle lobe distinctly marked, and divided into six segments; lateral lobe also divided, furnished with a narrow border."

This is a beautiful little trilobite that is quite distinct from described species of the genus.

There are but three specimens in the collection, and none show the head and pygidium united.

*Formation and locality*.—Cambrian. Saint John formation, Ratcliff's Millstream, N. B.

## MICRODISCUS PUNCTATUS, Salter.

Plate ii, figs. 1, 1a-c.

*Microdiscus punctatus*, Salter, 1864, Quart. Journ. Geol. Soc., vol. xx, p. 237, plate xiii, fig. 11.

*Microdiscus punctatus*, Whiteaves, 1878, Amer. Journ. Sci., 3d ser., vol. xvi, p. 225.

*Microdiscus pulchellus*, Hartt. Name proposed (No. 14) on list of fossils sent to Mr. J. W. Dawson.

Head semi-elliptical in outline, rather strongly convex, and bordered on the front and sides by a depressed furrow and raised rim, the furrow containing numerous short furrows perpendicular to the margin, as in *M. Dawsoni*, but not as strongly marked. The posterior border is strong back of the cheeks, and has the furrow continuing from the sides; a very narrow rim extends back of the glabella; eyes and facial suture entirely absent.

Glabella elongate conical, extending backward in a strong spine as long as the glabella in medium-sized specimens and nearly as broad at the base. In some examples the spine is shorter and smaller. The glabella rises above the level of the cheeks and is about three-fifths the length of the head, bordered by strong dorsal furrows that are connected in front by a straight furrow with the depressed groove within the anterior marginal border, perceptibly marked by two pairs of oblique glabellar furrows in some examples. Cheeks convex, prominent, strongly defined by the dorsal and marginal furrows.

Thorax unknown.

The pygidium, associated with the head of this species in great numbers, has the same general outline as the head. The narrow marginal rim is well defined all around, widest at the sides; anterior marginal furrow very distinct; median lobe elongate-conical, extending back nearly to the marginal groove; nine anchylosed segments are indicated by eight rather strong transverse furrows; lateral lobes strongly convex, no furrow appearing back of the anterior marginal groove.

Surface finely punctate, the punctæ being rather large as compared with the depth.

Dimensions of a rather broad head: Length, exclusive of spine, 3.5<sup>mm</sup>; breadth, 5<sup>mm</sup>; occipital spine, 3<sup>mm</sup>; pygidium, length, 3.75<sup>mm</sup>, breadth, 5<sup>mm</sup>.

This is an abundant and well-marked species. Mr. Hartt evidently intended to describe it, as the name is given in his list, and selected specimens were mounted on blocks, one of which bears the name *Eodiscus pulchellus*, Hartt, n. g., n. sp. There is considerable variation in the relative proportion of the length and breadth of the head, also of the pygidium in different specimens, owing to an original variation, and also distortion from compression in the shales.

Mr. Whiteaves states that this species was first detected in the

Primordial slates of Saint John, N. B., by the late Mr. E. Billings. It has since been observed in rocks of the same age on the Kennebecasis River, N. B., where it was collected by Mr. G. F. Matthew.

The pygidium is very similar to that of *Microdiscus speciosus*, Ford (Amer. Jour. Sci., vol. vi, p. 137, 1873).

In comparing with the figures of *M. punctatus* given by Mr. Salter, it is observed that the nuchal spine of *M. punctatus* is longer and more slender, and the surface of the cephalic shield and pygidium are punctate, whereas, in the Saint John's specimens, the surface is smooth. In event of the two forms proving distinct on a comparison of specimens, I propose that Mr. Hartt's name, *M. pulchellus*, be given to the American species.

*Formation and localities.*—Cambrian. Saint John formation, Ratcliff's Millstream, N. B., and Manuel's Brook, near Conception Bay, Newfoundland.

Genus PARADOXIDES, Brongniart.

PARADOXIDES LAMELLATUS, Hartt.

Plate iii, figs. 2, 2a.

*Paradoxides lamellatus*, Hartt, 1868, *Acadian Geology*, Dawson, 2d ed., p. 656.

*Paradoxides lamellatus*, var. *loricatus*, Matthew, 1882, *Trans. Roy. Soc. Canada*, p. 105, plate ix, fig. 19.

*Description.*—"This is a small species distinguished from several others found with it by the presence of a number of sharp perpendicular laminæ on the anterior lobe of the glabella."

The types of this species consist of the casts of portions of two heads, both of which are illustrated on plate iii. It is, as stated by Mr. Hartt, distinguished from the associated species by the sharp perpendicular laminæ or ridges in front of the glabella.

Mr. Matthew has indicated a variety as *P. lamellatus*, var. *loricatus*. The elevated ridges on the front of glabella are variable in the two type specimens, and I should not consider the variation cited by Mr. Matthew as of sufficient importance to establish a varietal name, especially as he suggests the idea that the transverse ridges or interrupted elevated lines owe their origin to the condensation of the frontal area by transfer to the glabella; this would necessarily induce a great variation in the form and arrangement of the elevated lines in relation to each other, although they might retain their general relation to the frontal margin.

*Formation and locality.*—Cambrian. Saint John formation, Portland, a little northward of Saint John, N. B.

PARADOXIDES ACADICUS, Matthew.

Plate iii, fig. 3, 3a.

*Paradoxides Acadicus*, Matthew, 1882, *Trans. Roy. Soc. Canada*, p. 103, Plate ix, figs. 16-18.

Mr. Hartt recognized several species of paradoxides and indicated them in his list, but did not name or designate the specimens, owing to



his not having time to work out the details (Acadian Geol., 2d ed., p. 657, 1868). One of these Mr. Matthew, in his valuable paper on the Paradoxides, has named *P. Acadicus*, describing it as follows:

"The anterior margin is regularly rounded and strongly arched backward. The marginal fold is moderately convex and about twice as wide at the extremity as in front of the glabella. The flat area is very small, and at the suture about as wide as the marginal fold.

"The glabella is about an eighth longer than wide. It expands regularly from the base to a point somewhat in advance of the fourth furrow, whence it is regularly rounded to the front.

"The glabellar furrows are all heavily cut. The first two cross the axis of the glabella; of these the first is arched decidedly backward, and is somewhat more heavily impressed in the outer than in the middle third. The second furrow strongly indents the glabella parallel to the transverse axis; it is more lightly impressed in the middle quarter than elsewhere. The two anterior furrows are in pairs. The third fails to cross the glabella by less than a third of the glabella's width; it begins within the margin of the glabella and is directed forward at an angle of about fifteen degrees. The fourth furrow begins on the edge of the glabella, and scarcely extends one-quarter of the way across it.

"The occipital ring is more than twice as long as wide; it is regularly convex and moderately arched vertically; a little behind the middle of the ring is a short tuberculous spine. In some of the largest heads the middle half of the ring is raised into a broad, rather flat, lobe which bears the spine. The occipital furrow is more strongly impressed in the outer quarter than in the middle.

"The posterior margin is moderately arched backward; the fold is regularly convex and moderately arched vertically. The furrow is scarcely as wide as the fold, and is rounded in the bottom.

"The fixed cheek is subtrapezoidal in form, is convex, and has an elevation at the posterior inner angle; it is strongly depressed in front, and the bounding furrows are distinct. The ocular lobe makes an open parabolic curve, and is prominently raised all round, but especially at the extremities. The curve of the posterior third of the ocular lobe in this species is more open than in that of the preceding species or its varieties.

"*Sculpture*.—Parallel raised lines appear only on the front half of the marginal fold, where there are about five. Elsewhere the surface of the test is covered with closely-set granulations visible to the naked eye.

"This neat little species is easily distinguished from all the preceding by its granulated surface, and by the absence of raised lines on the front of the glabella."

In the Hartt collection there is a specimen that adds materially to our knowledge of the species and the group of species to which it belongs, as fourteen segments of the thorax, the pygidium, and a portion

of the head are preserved. The head parts appear to be identical with the typical form described by Mr. Matthew, and are ornamented by the granulated surface, characteristic of the species. The thorax is very broad in proportion to its length, even though the fourteen segments preserved are not considered as entirely forming it. The allied Bohemian type, *Paradoxides rugulosus*, Corda (Syst. Silur. de Bohême., p. 347, plates ix and xiii), has but sixteen segments and the specimen under consideration shows no traces of more than fourteen; the anterior segments, however, are crowded down somewhat, and the head pushed to one side, which leaves the question of the actual number of segments unsettled. The median lobe is crushed together, but still shows that it had a width of 7<sup>mm</sup> or 8<sup>mm</sup> at the twelfth segment, the pleural lobe on each side of the same segment extending out 12<sup>mm</sup> from the median lobe and terminating in slightly curved mucronate points of the same length on all the segments; posteriorly the median and lateral lobes contract, the pleural portion of the last four segments expanding and bending back so as to close down to the side of the pygidium; the pleural grooves are well marked and extend out about half way on the pleural lobe. The pygidium is the type of that of *P. rugulosus*, (*loc. cit.*), and corresponds to figure 19 of plate x of Mr. Matthew's paper more closely than any other.

*Formation and locality.*—The locality is not given with the specimen, but Mr. Matthew cites the species from Portland, N. B., and the lithologic characters of the shale correspond to specimens from that locality.

#### PARADOXIDES ETEMINICUS, Matthew.

Plate iii, figs. 1, 1a-g.

*Paradoxides Eteminicus*, Matthew, 1883, Trans. Roy. Soc. Canada, vol. i; p. 92, plate x, figs. 7-12.

Mr. Matthew gives a very elaborate description of this fine species and divides it into *P. Eteminicus* and four varieties, viz: *Suricoides*, *breuius*, *Quacoensis*, *Malicitus*, and *pontificalis*, the differences separating each appearing in the glabella, fixed cheeks, and the anterior lateral limbs. From our experience with the varying forms of *Olenellus* from Nevada, we should scarcely consider these, on the evidence given, as more than varieties of one species, as Mr. Matthew has done. A number of specimens of this species occur in the collection. One head (sp.?) indicates a trilobite 18<sup>cm.</sup> or 20<sup>cm.</sup> in length when entire, the portion of the head remaining being 6<sup>cm.</sup> long.

For the purpose of illustrating the species of the Saint John fauna, known to me at present, several figures of *P. Eteminicus* are copied from Mr. Matthew's paper.

*Formation and localities.*—Cambrian. Saint John formation, Portland and Ratcliff's Millstream, N. B.

↳ Genus CONOCORYPHE, Corda.<sup>3</sup>

## CONOCORYPHE (Subgenus?) MATTHEWI.

Plate iv, figs. 1, 1a, b.

*Conocephalites Matthewi*, Hartt, 1868, *Acadian Geology*, Dawson, 2d ed., p. 646.*Conocephalites gemini-spinosus*, Hartt, 1868, *Acadian Geology*, Dawson, 2d ed., p. 653.

*Description.*—"Head semi-circular to semi-elliptical, more than twice as wide as long; front and lateral margins forming a regular curve; posterior margin nearly straight; posterior angles of shield flattened and rounded without spines; margin with a strong, round, rather narrow fold, which becomes narrower and lower towards the posterior angle of shield, where it disappears. This is separated from the cheek-lobes by a very deep, moderately-broad groove. This groove is arched forward in front by a large, semi-globose swelling, situated just in advance of the glabella, encroaching upon the marginal fold, causing it to be the thickest on each side of this prominence.

"The posterior margin is also folded, but the plait is more or less inclined backwards. The fold is narrow near the occipital ring, but grows more prominent and gains in width towards the posterior angle, but, like the anterior fold, it disappears at that point. Its course is not straight; at about half the distance of the outer angle it bends slightly backwards and downwards and then forwards slightly to disappear on the flattened or rounded angle of the shield. This fold is separated from the cheek-lobes by a groove shallower and broader than the marginal one, which it resembles, by expanding gradually into the flattened space of the outer angle. This groove follows a course parallel to the fold which it accompanies. Length from occipital furrow, about half that of head.

"Glabella subconical, longer than wide, strongly rounded in front, and about half as wide anteriorly as posteriorly; length about that of whole shield, strongly convex, but less elevated than the cheek-lobes, bounded laterally and anteriorly by deep grooves, the anterior being not so deep as the posterior. The sides of the glabella are impressed and divided into lobes by three pairs of deep lateral glabellar furrows. Those of the posterior pair are the longer and more deeply impressed. These furrows begin abruptly at a point somewhat in advance of the middle of the longer diameter of the glabella, and directed backwards at an angle of about 45° to the antero-posterior diameter of the shield, disappear abruptly without gaining the medial line, usually extending a little more than the third of the distance across the glabella. Those of the median pair begin also on the bounding groove very abruptly, only a little in advance of the posterior pair, but they are usually not so oblique, and extend on each side not more than a quarter of the distance across the glabella. The distance between the outer extremity of

<sup>3</sup> See note on this genus under remarks on the genus *Ptychoparia*.

the median and anterior furrows is somewhat less than between those of the median and posterior, and these but slightly impress the sides of the glabella, and occasionally are scarcely visible. The anterior lobe is about as wide as the one which follows it.

"The occipital furrow is deeply cut in the outer third of its length and strongly directed forwards; in the middle third it is not so deep and is quite strongly arched forwards. The occipital ring is narrow, strongly convex, and vertically arched, the sides being more or less narrowed, turned downwards and forwards, being projected obliquely more or less across the posterior marginal cheek-groove towards the inner posterior angle of cheek-lobe. The ring projects backwards beyond the margin, but not beyond the posterior lateral angle of shield. The middle part is produced into a very short conical tubercle-like spine, directed slightly backwards. The cheek-lobes are strongly gibbous, and very regularly arched, the convexity being stronger anteriorly. A narrow, distinct, wavy ocular ridge begins on the cheek-lobe, just opposite the anterior part of glabella, and, thinning gradually out and arching, at first slightly forwards, curves round and is directed towards the outer angle of cheek-lobe, but it usually vanishes before reaching that point. From its anterior outer side it throws off a very numerous set of fine, bifurcating, raised lines of ridges. These lines are directed outward from the primary line at a rather acute angle, and appear to bifurcate several times. This ocular ridge is thickened at its commencement, but is not so strongly marked at that point as in *C. Baileyi*. It is also more arched forward than in the latter species. The whole outer surface of the shield is covered by innumerable, close-set, raised points or granulations, just visible to the naked eye, but very distinct under the lens, appearing in the impression of the shield as minute punctures. These appear to be more distinct on the convex portions of the shield. The raised margins, cheek-lobes, glabella, occipital ring, as well as the lobe just in advance of the glabella, bear sparsely-sown, minute, short spines, which give to the surface a distinct granular appearance. These are always wanting in the furrows and on the cheek-lobes, are more crowded on the outer halves of the cheek-lobes. They are true spines, but usually appear as granulations on the casts.

"In very young specimens, a line in diameter, the shield is semicircular, the cheek-lobes are extremely gibbous, and very much more convex than the glabella, and the preglabellar lobe is very conspicuous."

The above description gives all the characters of the adult head of this species as shown in the specimens contained in the Hartt collection. A number of small heads show embryonic features, but as Mr. Hartt did not describe these and Mr. Matthew is at work on the species and its stages of development, we will await the appearance of his paper.

Mr. Linnarsson unites *Conocoryphe coronatus*, Barr. (Syst. Sil. de Bohême., vol. i, p. 424, plate xiii, figs. 20-26), *C. exsulans*, Linnarsson (Sv. Geol. Unders. Afh., Ser. C., N:o. 35, p. 17, 1879), *C. solvensis*,

Hicks (Quar. Jour. Geol. Soc., vol. xxvii, p. 400, plate xvi, fig. 8, 1871) and *C. Matthewi*, Hartt, as a natural group chiefly characterized by the boss or elevation in front of the glabella. He speaks of *C. (Elyx) laticeps*, Ang. (Pal. Scan., t. 5, figs. 2-3, 1854), as the nearest allied from among Swedish species, and there appears to be good reason for placing it very close to, if not in the *C. coronatus* group.

Mr. Corda proposed the generic name *Ctenocephalus* (Prodrom. Mon. böhm. Trilobiten, p. 142) for this type of the *Conocephalidæ*, and in many respects it is a convenient subgeneric term.

I know of no American species from the Potsdam or Georgian horizons that will fall within the group, although a species from the Georgian horizon, in Central Nevada, *Ptychoparia Linnarssoni*, Walcott (Pal. Eureka Dist., in press), has a boss in front of the glabella much the same as that in *C. coronatus*. The presence of large, free cheeks, well marked eyes, and facial sutures, places the species in the second division of the *Conocephalidæ* under the genus *Ptychoparia*, or a subgenus of the latter.

Mr. Hartt describes a second species of this group under the name *Conocephalites gemmini-spinosus*, as follows: "Resembles *C. Matthewi*, but with wider and less elevated marginal folds; cheek-lobes much more gibbous and semi-ovoid, &c., sparsely sown with minute spines, grouped two and two. Rare, at Saint John." This species does not appear on the list of numbered specimens, and I fail to find any specimens that differ from the typical forms of *C. Matthewi* sufficiently to warrant a separate specific name. Under the circumstances it appears best to place the name as a synonym of *C. Matthewi*, on the grounds of imperfect description, no illustration, no labeled type specimen, or a form in the collection that can be recognized as the one referred to by the author. Specimen No. 91 is referred to as *C. Matthewi* var. ? This is a well-marked variety in its surface characters, as the scattered tubercles of *C. Matthewi* are crowded together and give the glabella, cheeks, frontal lobe, and margins a granulated appearance quite unlike *C. Matthewi*. The ocular-like ridges are also lost in the crowding together of the tubercles; fig. 1 b., pl. iv.

*Formation and localities*.—Cambrian. Saint John formation, Ratcliff's Millstream, Saint John and Portland, N. B. The variety (= *granulata*) is labeled Cold Brook (= Portland, on authority of Mr. Matthew).

#### CONOCORYPHE WALCOTTI, Matthew.

In a letter received from Mr. G. F. Matthew May 22, 1884, written since the preparation of this paper, he states that he has found a species of *Conocoryphe* in the Saint John formation, characterized by transverse bars on the glabella, a granulated but not tuberculated surface, and other features separating it from the other species of the genus. For this species he proposed the name *Conocoryphe Walcottii* in

a paper "On the Conocoryphidæ of the Saint John group, with remarks on Paradoxides," read before the Royal Society of Canada, May, 1884.

Subgenus *SALTERIA*, n. subgen.

Dr. Henry Hicks, in his description of *Erinnys venulosa*, refers the species to Salter (Brit. Assoc. Rep., 1865), where we find the name used and the relations of the genus to Harpides pointed out, and the fact stated that it has a great number of free segments and no facial sutures and probably no eyes. The description of *Erinnys venulosa* (Quart. Jour. Geol. Soc., vol. xxviii, p. 177), is of the type species, and gives that of the genus as far as known.

*Description*.—"Ovate in form, being widest in front, and surface depressed. The largest specimens indicate a fossil at least  $3\frac{1}{2}$  inches long.

"Head semicircular, margined all round, but with no posterior spines wider than the body. Glabella small, occupying only about two-thirds of the length and about one-fifth of the width of the head; pyramidal in shape, slightly raised, and indented by three pairs of furrows, the hinder ones reaching backwards nearly to the neck-lobe, and marking off triangular lobes on each side.

"There are no distinctly-marked eyes or facial sutures, but a tolerably strongly-raised ridge strikes off on each side from opposite the upper glabellar lobes towards the posterior angles, reaching nearly two-thirds of the distance across. From these ridges lines strike off in each direction, especially forwards, dividing and subdividing in their course and giving a veined character to the whole surface.

"Thorax composed of 24 rings; axis narrow, convex, and tapering towards the tail; pleuræ compressed, grooved, and, including the spines, more than twice as long as the rings of the axis; spines bent backwards from the fulcrum, at which part the surface becomes suddenly raised into a sharp, transverse ridge.

"The tail is semicircular, and has a tolerably strong axis, composed of four segments. The lateral lobes are marked by four moderately well-defined ribs."

This is certainly a very remarkable form, and is, as stated by Mr. Salter, related to Harpides; still it does not appear to be congeneric with it.

The first generic use of the name *Erinnys* of which we have record, was by Mr. Schrank (Faun. Boica, vol. ii. pt. 1, p. 152, 1801), for a genus of Lepidoptera. Mr. Schrank spelled the name "*Erynnis*." Mr. Agassiz suggested in his Nomenclator Zoölogicus, 1846, that it be changed to *Erinnys*. The name was again used by Mr. J. Thompson (Arch. Ent., vol. i, 1857) for a genus of Coleoptera. In 1865 Mr. Salter proposed it for the genus under consideration, and in 1867 it was again proposed for a genus of Coleoptera by Mr. Oustalet (Scudder Index Univer., p. 115). As Mr. Salter's name was anticipated, it becomes

necessary to replace it, and the name *Salteria* is proposed in honor of the distinguished paleontologist. The generic description, as far as known, is essentially that of *Salteria venulosa*. With it we may place *S. Baileyi*, as it is an almost identical species, as far as can be determined from the head and pygidium.

CONOCORYPHE (SALTERIA) BAILEYI, Hartt.

Plate iv, figs. 3, 3a; pl. v, figs. 7, 7a.

*Conocephalites Baileyi*, Hartt, 1868, *Acadian Geology*, Dawson, 2d ed., p. 645.

*Description*.—"Head transversely semi-elliptical, half as long as wide; anterior margin in front more or less straight; posterior margin quite straight; posterior angles of cheeks slightly rounded and unfurnished with spines; facial suture never visible; anterior margin of shield with a narrow, very elevated border, which is widest and most elevated in front, and grows narrower and lower posteriorly, becoming obsolete, or nearly so, at the posterior angle of the shield. This border is separated from the other part of the shield by a deep, rather wide furrow, which is deepest in front, but grows shallower as the anterior border loses in height going posteriorly. General form of shield convex, but much depressed; glabella more depressed than the cheek, subtriangular, depressed convex, broadly rounded in front, and separated from the cheeks and front by a deep, well-marked furrow; width at base equal to length, which last is about seven-tenths that of shield; very much narrowed in front. Lateral bounding furrows inclined to one another at such an angle as would cause them to meet if produced to the middle of the front margin of head. Occipital furrow deep and well marked, slightly arched forward in middle, and curving downward and forward, growing narrower at the extremities, and less deeply cut than the bounding furrow of the glabella. No lateral glabellar furrows, or very slightly marked, ever seen on casts. Occipital ring more elevated and rather wider in the center; bent forward at the sides; narrow, with a very low, spine-like tubercle in the center. Posterior furrow moderately deep and wide. Sides of shield bent slightly downward. Posterior angles flattened. Cheeks subtriangular, bounded by the straight dorsal furrow, the straight groove which separates them from the glabella and the curved marginal furrow. They are more convex or gibbous than the glabella, sloping gently toward the marginal furrow, but steeply to the other bounding grooves. In the cast they are marked on the edge of the bounding groove of the glabella at the points where the straight sides of the latter begin to curve around the front by two small, low, but well-marked ocular prominences, from each of which extends a slight ocular ridge, with a more or less outward curve toward the posterior angle of the shield, but usually losing itself at about half the distance in a system of delicate ramifications, which may often be traced to the posterior angles of the cheek lobes. Like ramifications are thrown

off for the whole length of the ridge from its anterior side, and these occupy the surface of the cheek lobes in front of the line. The surface of the cast sometimes appears granular, but the mould is always smooth, and the outer surface of the shield was unfurnished with tubercular or granular ornamentation. The posterior border on each side of glabella is very elevated in the middle, and loses height thence each way. Cephalic shield sometimes an inch and a half in width."

On one specimen referred to this species the left postero-lateral angle of the head shows a short, slender, rounded spine, a feature not mentioned in the original description, and a short facial suture cuts off a slender strip of the postero-lateral side of the cheek, carrying the spine with it.

The resemblance between the head of this species and that of *C. (Salteria) venulosa* is very striking, the greatest difference appearing in the presence of a suture line and postero-lateral spine. I suspect, however, that, as in the case with *C. (S.) Baileyi*, the free cheek and spine are broken away in *C. (S.) venulosa*, and have not been observed, owing to that. One specimen of *C. (S.) Baileyi* preserves twelve segments of the thorax and the pygidium. The latter is of the type of that of *C. (S.) venulosa*, but the thoracic segments vary considerably at the genal angle of the pleural lobes and in the rounded instead of falcate terminations of the pleuræ. The true number of segments in the thorax is unknown.

*Formation and locality.*—Cambrian. Saint John formation. Ratcliff's Millstream, N. B.

#### CONOCORYPHE ELEGANS, Hartt.

Plate iv, figs. 2, 2a, b.

*Conocephalites elegans*, Hartt, 1868, *Acadian Geology*, Dawson, 2d ed., p. 650.

*Description.*—"Head or cephalic shield semi-circular or semi-elliptical, more than twice as broad as long, nearly straight behind; anterior border with a very strong fold, separated from the rest of the head by a deep groove. This fold is widest and most elevated just in front of the glabella, where it is sometimes the tenth of an inch in width. At this point the groove bends abruptly and angularly, and arches forward on each side so as to encroach on the marginal fold and cause it to disappear at about half the distance between the middle point in front and the posterior angles of shield. The posterior marginal folds are very thin, most elevated in the middle, and sloping each way towards the occipital ring and posterior angles of shield. The axis of the outward half is more and more inclined backward from the perpendicular towards the posterior angles, which are rounded, more or less flattened, and with out backward projecting spines. The grooves separating the posterior fold from the cheeks are very deep, and are slightly directed forward. Length of glabella about sixth-tenths of antero-posterior diameter of

(313)



shield, a little wider at base than long, and less than half as wide anteriorly; triangular, with anterior part rather broadly rounded, highly inflated, and bounded by deep grooves, which in front join in with the anterior marginal groove. There are three pairs of glabellar furrows. Those of the posterior pair impress deeply the sides of the glabella, are strongly curved backwards, and scarcely reach a third of the distance across each side. The second and third pairs only just impress in like manner the sides of the glabella. Those of the second pair are curved backward, and extend about a quarter of the distance across the glabella. Those of the third pair are very short, and appear to be parallel with the transverse diameter, but they are not always distinct.

Occipital furrow deep, slightly arched forward in the middle, and with the ends turned in the same direction; occipital ring of moderate width; the middle is produced into a spine often more than a quarter of an inch in length. This spine is more or less strongly directed backwards. The cheek-lobes are very gibbous, more so than the glabella. Their posterior border is so strongly impressed by the posterior furrow that it arches slightly over it. The surface of the convex part of the shield is ornamented by very fine, close-set granulations, distinctly visible to the naked eye, and by a set of delicate little tubercles more sparsely sown."

This distinct and finely ornamented species may be compared with *Conocoryphe bufo*, Hicks (Quart. Journ. Geol. Soc., vol. xxv, p. 52, 1869). In the form of the head, frontal margin, and glabella, the character of the granulose surface and absence of facial sutures and eyes, as far as known, they are very much alike. We know of the presence of the postero-lateral spines of the head in *C. elegans*, but not the occipital spine in *C. bufo* which is present in *C. elegans*. *Conocoryphe Dalmani*, Angelin (Pal. Scan., p. 63, pl. xxxiii, fig. 16, 1854), belongs to the same group of species and is very closely related to them. Linnarsson speaks of *C. tenuicincta*, Linn., *C. emarginata*, Linn., *C. Dalmani*, and *C. bufo* as forming a natural group (Sv. Geol. Unders. Afh., Se. O. N:o. 35, p. 20, 1879), and with these we add *C. elegans*, as it is a similar type and nearly identical with *C. bufo* and *C. Dalmani*.

*Formation and locality*.—Cambrian. Saint John formation, Ratcliff's Millstream, N. B.

#### Genus PTYCHOPARIA, Corda.

*Ptychoparia* Corda, 1847, Prodröm. Mon. böhm. Trilobiten, p. 141, Abh. den K. Böhm. Gesells. den Wissenschaften.

= *Conocephalus* Zenker, 1833 (in parte); *Solenopleura*, Angelin, 1851 (in parte); *Crepicephalus*, Owen, 1852 (in parte); *Conocephalites*, Barrande, 1852 (in parte).

In looking up the history of the generic names *Conocephalus*, *Conocoryphe*, *Ptychoparia*, and *Conocephalites*, we find that *Conocephalus* was first proposed by Mr. Zenker in 1833, with *C. Sulzeri* as the type, a trilobite without eyes and having a peculiar direction to the facial sutures of the head.

In 1839 Mr. Emmrich described, as a distinct species from *C. Sulzeri*, *Conocephalus striatus*, referring it to the same genus, although it has well-developed eyes and a direction of the facial sutures unlike that of *C. Sulzeri*.

Mr. Corda, in 1847, observed that *C. Sulzeri* and *C. striatus* represented two generic groups, and as the name *Conocephalus* had been preoccupied for a genus of insects in 1812, he proposed two generic names for the two types, *Conocoryphe* being given to *C. Sulzeri* and *Ptychoparia* to *C. striatus*. This division appears to me to be one demanded by the characters of the two types, and I fully indorse the opinion of the late Mr. F. B. Meek (Sixth Ann. Rep. U. S. Geol. Surv. Terr. 1872, p. 487), that Mr. Corda's names should be adopted and the subsequent name, *Conocephalites*, proposed by Mr. Barrande in 1852, treated as a synonym. Mr. Corda used the same type species in proposing the genus *Conocoryphe*, and there does not appear to be sufficient reason for refusing to adopt the name. Of the value of the genus *Ptychoparia* paleontologists may differ, but if we unite before our minds the characters of *Ptychoparia striata* and *P. Emmrichi*, the types referred to by Mr. Corda, and then bring together the group represented by *Conocoryphe Sulzeri*, *C. coronatus*, *C. exsulans*, Linnarsson, *C. solvensis*, Hicks, and *C. Matthewi*, Hartt, in the same manner, we will observe differences that, to me, appear to be of undoubted generic value. This division may be carried still further if we adopt Mr. Corda's third division of *Conocephalus*, *Ctenocephalus*, as a subgenus of *Conocoryphe*, and place *C. coronatus*, *C. Matthewi*, *C. exsulans*, and allied species under it. From Mr. G. F. Matthew's study of *C. Matthewi* I am very much inclined to adopt *Ctenocephalus* in that manner.

Mr. Meek (*loc. cit.*) thinks that in adopting this view the generic name *Ptychoparia* will necessarily be applied to nearly all the species of the *Conocephalidæ* described from American rocks. With some considerable exception this is true, and especially so of the group placed under the generic name of *Crepicephalus*, by Messrs. Hall and Whitfield (Geol. Expl. Fortieth Par., vol. iv, p. 209, 1877). They revived the genus which was proposed by Mr. Owen (Geol. Surv. Iowa, Wis., and Minn., p. 576), making *C. Haguei* the first species.

For the purpose of placing before all the means of comparing the types of the two genera, they are figured side by side on plate v. *Ptychoparia striatus*, the type of the genus, has two more segments in the thorax than *P. Haguei*, but that is not a character of generic value of itself. Of Mr. Owen's type of the genus *Crepicephalus*, *C. Iowensis*, only the head is known, although the pygidium usually associated with the head is peculiar and might give rise to a subgeneric group, but not as defined by Mr. Owen or Messrs. Hall and Whitfield.

*Ptychoparia Emmrichi*, Barr. (Syst. Silur de Bobême, I, p. 428, plate ii, Figs. 2-6), the second species arranged under the genus by Mr. Corda, differs in having the central portion of the head between the sutures in

front of the eyes narrower than in *P. striata*, a feature quite prominent in the species from the Potsdam group in Wisconsin, etc. The pygidium is also more like that of *P. Haguei*, and the pleura have less angular extremities. If the student will compare fig. 4, plate ii (Syst. Silur. de Bohême, vol. i, 1852), *P. Emmrichi*, with fig. 7 of plate xiii of the same work, I think that he will scarcely wish to place the two species in two subgeneric groups. If not, there appears to be no other way but to place *Crepicephalus* as a synonym of *Ptychoparia* for all species except *P. (Crepicephalus) lowensis*, where it may be used as a subgenus on account of the peculiar pygidium. The genus *Loganellus* Devine (Geol. Canada, Pal. Foss., vol. i, p. 200), is of the same type as *Ptychoparia Emmrichi*, and is considered by Messrs. Hall and Whitfield as identical with *Crepicephalus* = *Ptychoparia Haguei*. *Solenopleura* Angelin (Pal. Scan., p. 26) and *Liostracus* Angelin each approach this group. *Liostracus* represents the forms with the glabella devoid of furrows and the presence of ocular ridges on the fixed cheeks, and is a convenient subgeneric group. *Solenopleura* appears to be of the same character as many of the species placed under the genus *Bathyrurus* by Mr. Billings, and I think can be used for such forms as *Bathyrurus gregarius*, Billings (Pal. Foss., vol. i, p. 363), and nearly all the species referred to the genus *Bathyrurus* from the Cambrian. The figure of the type species of *Solenopleura* is copied on plate vi, fig. 3.

Among the species from the Saint John formation *Ptychoparia Robbi* approaches most nearly to the typical forms of the genus *Ptychoparia*.

#### PTYCHOPARIA ROBBI, Hartt.

Plate vi, figs. 1, 1a.

*Conocephalites Robbi*, Hartt, 1868, *Acadian Geology*, Dawson, 2d ed., p. 648.

*Conocephalites formosus*, Hartt, 1868, *Acadian Geology*, Dawson, 2d ed., p. 654.

*Description*.—"Head without movable cheeks, of moderate size, depressed convex, slightly arched in front, where the width is considerably less than behind; length about equal to breadth in front.

"Glabella ovate conical, sides straight, and dorsal furrows so inclined as to meet if produced in middle part of anterior margin; very convex; more elevated in the middle; posterior furrows reaching about one-third of the way across the glabella, directed strongly backwards, and reaching nearly to the base of the glabella; middle furrows less distinctly marked, short, not so oblique as first; anterior very short, appearing only as little pits or depressions on the sides of the glabella.

"Occipital ring narrow, convex, widest in the middle, narrowing towards the sides, which are turned forward, giving to it a crescent shape. Occipital furrow deep and well developed, widest in the middle, where it slightly impresses the base of the glabella; narrow and slightly bent forward at the ends. The ring bears a little, short, conical, tubercle-like spine in the middle, directed slightly backwards.

"Fixed cheeks, frontal limb one-third to one-fourth of whole length of head, with a narrow, high, convex border, inside of which is a moderately deep furrow; cheek-lobes depressed, convex, meeting in front, rising abruptly from the deep dorsal furrow, on the borders of which they reach their greatest elevation, which, however, is not equal to that of glabella, and sloping thence roundly towards the sides and front. The posterior limb bears a deep, wide, furrow, which widens somewhat near extremity. The marginal fold is very narrow and of little prominence, and widens a little in the outer half. The posterior margin bends slightly backwards at extremity of limb, which is rounded."

On comparing the type specimens of *P. Robbi* and *P. formosus*, and also a number of specimens of *P. Robbi*, I am unable to obtain good specific differences between them. The range of variation is slight and the two extremes are intimately united by specimens possessing the characters of each in a more or less fully developed condition. *P. formosus* appears to have been founded on compressed specimens of *P. Robbi*.

The representative type of *P. Robbi* occurs in the Menevian of Wales as the very closely related species *Ptychoparia* (= *Conocoryphe*) *applanata*, Salter (Quart. Jour. Geol. Soc., vol. xxv, p. 53, pl. xxv, figs. 1, 2, 4, 5). In *Ptychoparia* (= *Solenopleura*) *cristata*, Linnarsson (Afdrag ur Geol. Foreningens, i Stockholm Förhandl. 1877, N:o. 40, Band. iii, N:o. 12, p. 370), from the Paradoxides beds of Sweden, we find an allied species, and Mr. Linnarsson compares it with *P. Emmrichi*, the nearest representative of the type in Bohemia.

*Formation and locality*.—Cambrian. Saint John formation, Ratcliff's Millstream, N. B.

#### PTYCHOPARIA OUANGONDIANA, Hartt.

Plate v, figs. 4, 4a-f.

*Conocephalites ouangondianus*, Hartt, 1863, Acadian Geology, Dawson, 2d ed., p. 651.

*Description*.—"Head without movable cheeks; strongly convex in outline, somewhat subangular in front; much narrower in front than behind, where width is greater than the length; width in front nearly equal to length; anterior margin wide, with a strong fold, whose axis is strongly inclined forwards, so that it presents a short, steep, convex slope forward, and a long, concave slope in the inner side, being much less elevated than glabella or fixed cheeks. Glabella long, ovate-conical, nearly twice as wide posteriorly as in front; very convex, slightly subangular at the middle; sides straight, inclined to one another so as to meet in the middle of front margin if produced; rounded in front; casts sometimes showing three pairs of short, raised, transverse lines on the sides of the glabella, occupying the position of the ordinary glabellar furrows; of these the two posterior are directed obliquely backwards. In some specimens there seems to be a fourth pair in ad-

vance of the other, represented by little tubercle-like processes situated on the side of the glabella in front, just where the sides curve to the front. Glabella very much more convex than fixed cheek. Occipital ring strongly arched upward, and separated from glabella by a well-marked groove; middle of posterior margin produced backwards in a short conical spine. Fixed cheeks highest along dorsal furrow, towards which they pressed abrupt round slopes, while their general surface slopes gently and quite evenly towards front of sutures. The dorsal furrows are confluent in front with the flat margin, so that the cheek-lobes do not meet in front. They are highest along the straight dorsal furrows, but where they bend to go round the anterior extremity of glabella, the cheek-lobes narrowing and curving towards each other, gradually sink away and disappear in the front flattened space. The ocular lobes are very well developed, forming subsemicircular lappet-like lobes, curved strongly upwards, and situated about opposite the center of the head. An ocular ridge, low and rounded, but very prominent, runs from anterior margin of ocular lobes, with a curve almost parallel with front margin of shield, but slightly divergent from it to the dorsal furrow, which it gains at a point considerably back of front of glabella, and where the straight part of the dorsal furrow bends to go round the front. Posterior limb short and broadly rounded. Post-marginal furrows less deep than dorsal; wider; marginal fold narrow and moderately prominent; shield strongly arched transversely; surface smooth."

This species is more fully represented by the central portion of the head than any other in the collection. The range of variation appears to have been small originally, but the distortion by lateral and vertical compression gives it a variety of forms. Three of these are illustrated.

A small head that appears to be uncompressed looks very much like that of *P. (Solenopleura) cristata*, Linnarsson. (See description of *P. Robbi*.) Mr. Hartt speaks of this species as rather uncommon at Ratcliff's Mill stream, but on examining all the duplicate material we find upwards of forty specimens. From the character of many of the specimens it appears quite probable that some of this material was not before him when he wrote the notes on the species.

*Formation and locality*.—Cambrian. Saint John formation, Ratcliff's Millstream, N. B.

PTYCHOPARIA OUANGONDIANA, var. AURORA, Hartt.

Plate v, fig. 5.

*Conocephalites aurora*, Hartt, 1868, Acadian Geology, Dawson, 2d ed., p. 653.

*Description*.—"Resembles *C. ouangondianum*, but differs in wider head, more depressed; anterior margin more broadly rounded, and border more strongly reflexed and elevated."

To me the distinctive character between this species and *P. ouangondiana* is in the form of the glabella. Compression and distortion may give the depressed broader form and reflexed rim, but not entirely the subquadrate glabella, that appears to be a feature of original varietal importance. With a large series of specimens of this form showing its variations, the tendency will be to deprive it even of a varietal name and unite it directly with *P. Ouangondiana*.

*Formation and locality*.—With the preceding species at Ratcliff's Mill-stream, N. B.

PTYCHOPARIA QUADRATA, Hartt.

Plate v, fig. 1.

*Conocephalites quadrata*, Hartt, 1868, *Acadian Geology*, Dawson, 2d ed., p. 654.

*Description*.—"Head minute, transversely oblong, twice as long, slightly curved in front, straight behind, very flat; a narrow elevated fold, convex in front, concave behind, and somewhat inclined backward, goes round the margin."

There appears to be but one specimen representing this species in the collection. The strongly-marked subquadrate glabella distinguishes it at once from the associated species except *P. ouangondianus*, var. *aurora*, from which it is scarcely separated by the character of the frontal rim and the stronger ocular ridges. The entire length of the head is but two millimeters.

*Formation and locality*.—Cambrian. Saint John formation. Portland, a little northward of Saint John, N. B.

PTYCHOPARIA ORESTES, Hartt.

Plate v, fig. 3, 3a.

*Conocephalites orestes*, Hartt, 1868, *Acadian Geology*, Dawson, 2d ed., p. 649.

*Conocephalites Halli*, Hartt, 1868, *Acadian Geology*, Dawson, 2d ed., p. 654.

*Description*.—"The head-shield of this species without movable cheeks is of medium size, length about equal to breadth in front, or to two-thirds width behind; margin arched moderately in front, with a rather wide, low border fold, widest in front, narrowing toward the sides, separated from the rest of the head by a shallow groove. Glabella long, ovate, conical, or cylindrico-conical, extremely convex, wider behind than in front, where it is rounded. The sides are straight, and so inclined to one another as to meet, if produced, at a distance in advance of margin in front about equal to the distance of that line from glabella. The glabella is flattened on the sides and never regularly convex. There are three pairs of furrows, which lightly impress the sides of the glabella, and of which traces are not always distinctly preserved, and they are apt to be seen best in slightly distorted specimens. Dorsal furrow narrow, deep, and sharply cut; occipital ring widest in the middle, narrowed from behind at the sides, separated from glabella by a

distinct furrow. Bears in the middle a minute tubercular spine pointing upwards. Fixed cheeks strongly convex, but much less so than the glabella, meeting in front with abrupt slopes toward dorsal and posterior marginal furrows, but with gentle rounded slopes toward sides and anterior groove. Ocular ridges, marked as lightly raised lines, originating at the dorsal furrow some distance behind the front of the glabella, and rising obliquely upwards and backwards to ocular lobes, which are small and semi-lunar, folded considerably upwards, and are situated just opposite middle of head; width between ocular lobes about equal to the width in front. Behind the eye the suture describes a long open sigmoid curve, which is continued inward somewhat so as to give the limb a rounded outline, and make the cheek here about one-third wider than at the eye. Posterior margin of cheeks with a slight fold, more prominent in the middle; outer half of this margin is arched backwards. Whole head arched slightly forward vertically."

The relations of this species are with both *P. Robbi* and *P. Ouangondiana*. From the former, the character of the frontal rim and the more elongate glabella serves to separate it, and from the latter the rounded rim-like frontal border instead of the broader flattened margin. The relations of *P. Orestes* and *P. Ouangondiana* are very close.

Specimen No. 59 is recorded in M. Hartt's list as *Conocephalites Halli*, and that name is scratched on the slate beside the specimen. The figure in the Acadian Geology (Fig. 227) was certainly not drawn from this specimen, but the description appears to have been.

*Description*.—"Well separated from all others by its very convex, narrow, and long glabella, ovate, or cylindro-conical, as well as by its strongly-rounded sub-angular outline in front, and by its peculiar anterior marginal fold."

I have studied the type specimens and also the representations of *P. Orestes* and Mr. Hartt's *C. Halli* in the collection, and it appears to be impossible to find characters that are persistent in a series of individuals to separate them as distinct species.

*Formation and locality*.—Cambrian. Saint John formation, Ratcliff's Millstream, N. B. The type of Mr. Hartt's *C. Halli* is from the same locality.

#### PTYCHOPARIA ORESTES, var. THERSITES, Hartt.

Plate v, fig. 2.

*Conocephalites Thersites*, Hartt, 1868, Acadian Geology, Dawson, 2d ed., p. 653.

*Description*.—"Differs from the last (*Conocephalites Aurora*) and also from *C. Ouangondianum* in the front margin being broad and flat, and bordered by a low, narrow, flattened fold or ridge, &c. Glabella in the cast has three pairs of very short raised lines on the sides."

This species appears to have been founded on a single somewhat distorted head, exclusive of the free cheeks. Its relations to *P. Ores-*

tes are very close, and I had placed it with *C. Halli* under *P. Orestes* in a preliminary study of the species. The material is so fragmentary and poorly preserved that it is difficult to satisfactorily determine the limits of many of the species.

*Formation and locality.*—Cambrian. Saint John formation, Ratcliff's Millstream, N. B.

#### PTYCHOPARIA TENER, Hartt.

Plate v, figs. 6, 6a, b.

*Conocephalites tener*, Hartt, 1868, *Acadian Geology*, Dawson, 2d ed., p. 652.

*Conocephalites neglectus*, Hartt, 1868, *Acadian Geology*, Dawson, 2d ed., p. 654.

*Description.*—"Minute, glabella ovate-conical, truncate at base, rounded in front, where it is about half as wide as at occipital furrow, slightly contracted behind, length about equal to width at occipital furrow, strongly depressed convex, more elevated at base than at front, and higher also than fixed cheeks; aspect varies with state of preservation of specimens, arcuate, rounded, convex, or concave; the middle seems to be inclined to project back slightly over the occipital furrow, slopes abruptly to occipital furrow, which is moderately deep, wide, and narrowed, and slightly inclined forward at the ends, where it terminates abruptly; bounding groove deeper than other grooves in head; occipital ring projecting backward bodily beyond higher margin, with the axis of its fold inclined more or less backward, and produced in the middle into a short conical backward inclined spine; anterior limb regularly arched, as if the outlines of the complete head were semicircular.

"Fixed cheeks, anterior border broad, flat concave, rising more or less abruptly to a sharp, thin, marginal fold; width between anterior extremities of cheek sutures equal to or about twice width of glabella at base. Cheek-lobes but slightly convex, and much more depressed than the glabella. Ocular ridges very distinct, thin, sharp, elevated ridges, that begin about inner edge of cheek-lobes, just behind rounded front of glabella, run outward and backward at an angle of 60° to 65° to the antero-posterior diameter. They are at first straight, but soon begin to bend backward more and more abruptly, forming a fragment of a spiral, their extremities being slightly directed inwards. The width between the ocular lobes is about equal to twice the length of the glabella. The ocular ridges are inclined outwards and forwards. Another ridge of the same appearance begins a very short distance behind the origin of the former, and on the very margin of the cheek-lobes, and, diverging from the margin nearly opposite to the base of the glabella, bends off abruptly along the posterior margin of the cheek-lobe, describing a curve, whose convexity is directed backwards. This ridge terminates considerably outside of the ocular lobe, at a point distant from the glabella about equal to half the width of the latter at its base. This ridge is usually found inclined in the opposite direction to the former,



viz, inward and backward. Posterior margin of fixed cheeks moderately and regularly S curved, the inner halves curving forwards, the outer halves backwards, with a marginal fold most elevated in the middle but much less so than the ridges of the cheek-lobe or the anterior fold. This fold becomes double at about the middle, by the appearance of a groove running along its summit, and it appears to run out before reaching the lateral suture. The width between the posterior extremities of cheek-sutures is considerably greater than between the anterior extremities or between the ocular lobes. Glabella without furrows."

This is a very striking and peculiar species, owing to the development of the sharp ocular ridges and the ridges between them and the glabella.

Associated with *P. tener* is a form described by Mr. Hartt as *O. neglectus*:

*Description*.—"Glabella regularly semi-elliptical; length, exclusive of occipital ring, about two-thirds of the width at base, moderately convex. Highest at middle of base and sloping with a regular curve toward the front. Traces of two pairs of glabellar furrows on the sides. Occipital furrow deep and concave. Occipital ring with straight parallel margins, narrow, with a short conical spine directed upward."

The type specimen, No. 341, of Mr. Hartt's list, shows the same ocular ridges as in *P. tener* and also the same ridges on the inner side of the palpebral lobes. The specimen has been compressed so as to shorten and widen the glabella, and give it the characters mentioned by Mr. Hartt. On the evidence of the material in the collection, it does not appear to represent a distinct species from *P. tener*.

*Formation and locality*.—Cambrian. Saint John formation, Portland a little northward of Saint John, N. B.

## FAUNA OF THE BRAINTREE ARGILLITES.

Wishing to examine typical specimens of *Paradoxides Harlani*, the writer visited Boston, and through the kindness of Mr. Alpheus Hyatt, curator in charge of the collections of the Boston Society of Natural History, he not only obtained access to the collection from the Braintree argillites, but the loan of such specimens as were wished for study and illustration. Mr. Alexander Agassiz also gave permission to use material in the collections of the Museum of Comparative Zoölogy, and Mr. N. S. Shaler placed his private collection at the writer's disposal. It is owing to these favorable conditions that I am able to present at this time illustrations and descriptions of the fauna of the Braintree argillites.

The first notice of the presence of fossils in the patches of argillite associated with the Quincy granite in the north end of the town of Braintree, Mass., was by the late Mr. William B. Rogers, who called the attention of the members of the Boston Society of Natural History to it when exhibiting specimens of a large trilobite found at Hayward's quarry (Proc. Boston Soc. Nat. Hist., vol. vi, p. 27, 1856). Subsequently Mr. Rogers traced the history of the trilobite described by Mr. Jacob Green as *Paradoxides Harlani*, in 1834, and showed quite conclusively that it came from Hayward's quarry and was identical with the species found there. Mr. Henry D. Rogers published the best figure of the species yet given, with remarks on its discovery, &c. (Geol. Surv. Penn., vol. ii, p. 816, 1858).

Numerous collectors obtained specimens of *Paradoxides Harlani*, but it is not until 1861 that we find any notice of other species. Mr. Albert Ordway then states that he had found a fragment of a trilobite similar to that described in the *Paradoxides* beds of Newfoundland, in association with *Paradoxides Bennetti*, and which he referred to the genus *Ellipsocephalus*. He also mentions the discovery of "a distinct fucoidal impression which shows three branches, each about 4 inches long, but not sufficiently well marked to afford any evidence with regard to its nature" (Proc. Boston Soc. Nat. Hist., vol. viii, p. 6, 1862). The small trilobite is probably the same as that subsequently described by Mr. R. P. Whitfield as *Arionellus* = *Agraulos quadrangularis* (Bull. Amer. Mus. Nat. Hist., vol. i, p. 147, 1884). Mr. Ordway also published a figure of the head of *Paradoxides Harlani*, when comparing that species with *Paradoxides spinosus*, Boeck, which Mr. Barrande considered as identical with *P. Harlani* (Bull. Geol. Soc. France, vol. xvii, pp. 545-548, 1860).

In the year 1863 a restored figure of *Paradoxides Harlani*, by Mr. F.

B. Meek, was published in Dana's Manual of Geology and repeated in each subsequent edition of the Manual. This very well represents the general characters of the species.

The publication of the second described species by Mr. Whitfield gives a stronger interest to the fauna, which is now increased by the addition of another species of trilobite, *Ptychoparia Rogersi*, and a species of Pteropod, *Hyolithes Shaleri*.

In seeking for a fauna in the Cambrian system of North America to compare with that of the Braintree argillites, we are at once directed to the Paradoxides beds of Newfoundland by the almost perfect identity of the leading type of each locality, *Paradoxides Harlani* and *P. Bennettii*. I think it has yet to be decided that the two are distinct species. *Hyolithes excellens*, Billings (Pal. Foss., vol. ii, pt. 1, p. 70, 1874), is very closely related to *H. Shaleri*, more so than to any other American species, and *Agraulos socialis*, Billings (*loc. cit.*, p. 71), is of the same type as *A. quadrangularis*, Whitfield, as shown by figure 1 of plate vii. *Ptychoparia Rogersi* does not appear to be represented in the Newfoundland Paradoxides beds, unless it be by *Ptychoparia (Solenopleura) communis*, Billings (*loc. cit.*, p. 72).

Mr. Barrande has shown the strong resemblance between *Paradoxides spinosus*, of the Bohemian Basin, and *P. Harlani*; and the Paradoxides beds of Sweden, Bohemia, Wales, Newfoundland, and Braintree have frequently been correlated in a general manner by authors.

#### Genus HYOLITHES, Eichwald.

##### HYOLITHES SHALERI, n. sp.

Plate vii, figs. 4 4a-c.

Form an elongate triangular pyramid, slightly arching towards the dorsal side and expanding regularly from the apex towards the aperture. Transverse section midway of the length, semielliptical, with a width twice as great as the height; the lateral angles acute. Ventral face gently convex transversely, curving slightly longitudinally. Dorsal face strongly convex, and showing a slight tendency to become angular at the center, a little concave longitudinally. From the direction of the surface lines the aperture appears to have been oblique. Operculum unknown. Surface marked by lines of growth that on the dorsal side are nearly transverse, and on the ventral side arched forward; traces of fine longitudinal lines are shown in the matrix of the ventral side.

*Dimensions*.—Length, about 90<sup>mm</sup>; breadth of aperture, 23<sup>mm</sup>; height of aperture, about 14<sup>mm</sup>. The apex is broken away, and the aperture a little crushed by compression.

The most nearly related American species is *Hyolithes excellens*, Billings (Pal. Foss., vol. ii, pt. 1, p. 70, fig. 39, 1874), from Smith's Sound,

Trinity Bay, New Foundland. Mr. Billings's description and figures lead me to think that the two species are closely allied, but still distinct, species.

The specific name is given in honor of the discoverer of the specimen illustrated, Mr. N. S. Shaler, Paleontologist of Harvard University.

*Formation and locality.*—Lower Cambrian. Braintree argillites, Hayward's Quarry, South Braintree, Mass.

### Genus PARADOXIDES, Brongniart.

#### PARADOXIDES HARLANI, Green.

Plate vii, fig. 3; plate viii, figs. 1, 1a-e; plate ix, fig. 1.

*Paradoxides Harlani*, Green, 1834, Amer. Journ. Sci., vol. xxv, p. 336.

Rogers, Wm. B., 1856. Proc. Boston Soc. Nat. Hist., vol. vi, pp. 27-29, pp. 40-44; *ibid.*, Stodder, p. 369. Rogers, Wm. B., also in Amer. Jour. Sci., 2d ser., vol. xxii, p. 296. Rogers, H. D., 1858. Geol. Penn., vol. ii, p. 816. fig. 590.

Ordway, 1861. Proc. Boston Soc. Nat. Hist., vol. viii, pp. 1-5; *ibid.*, Jackson, p. 58.

Dana, 1863. Manual of Geology, p. 189, fig. 245. This figure appears in each subsequent edition of the Manual.

Compare *Paradoxides spinosus*, Boeck.

Mr. Green's original description is as follows:

*Description.*—"The contour of the buckler in this species cannot be satisfactorily determined from our present specimen; the anterior and posterior parts of it are well defined, but the cheeks on each side are either mutilated or obscured. The *front* is very much elevated above the surface of the cheeks. It rises a little before the anterior edge of the buckler, is rounded in front, and gradually tapers towards the middle lobe of the abdomen, with which it forms a regular continuation. On its posterior surface there are three transverse furrows; the upper one crosses it a little obliquely, and there is on each side above a considerable protuberance. The *cheeks* were, no doubt, in the form of spherical triangles, but whether the outer angles terminated in acute prolongations cannot, from our specimen, be determined. The *organs of vision* appear to be entirely wanting. There are two shallow depressions on each side of the cheeks, commencing near the protuberances on the front, and running towards the lateral edges of the buckler. The posterior border of the buckler, where it joins the lobes of the abdomen, is marked by a transverse groove, nearly continuous with the lower transverse furrow on the front; this groove at its commencement appears to bifurcate outwards. The *abdomen* and *tail* cannot be distinguished from each other. There are seventeen distinct articulations in both. The middle lobe is very convex, and is separated from the lateral ones by a deep channel; it gradually tapers to an obtuse tip. In our specimen there is a small part of the tail of another trilobite deposited in this place, which at first sight appears to be a dislocated fragment

of our animal. The *lateral lobes* are flattened; the costal arches are very distinct near their insertion, and for about half their length, but towards their free extremities they are a good deal obliterated. There appears to have been a delicate *membranaceous prolongation* for a considerable distance beyond the solid portion of each rib. This organization is very apparent on the costal arches of the tail. There is a deep groove running obliquely over the upper surface of each rib. *Length* of the fossil about 9 inches; *breadth*, about 4 inches."

Mr. Green did not know the true locality of the specimen sent to him by Mr. Harlan, and it was not until twenty-two years after that Mr. W. B. Rogers announced the discovery of specimens of the same species at South Braintree, near Boston, Mass., identifying the locality of the specimen used by Mr. Green in his original description. The description is unaccompanied by figures, but fortunately Mr. Green made numerous casts of the type, one of which is now before me. It is the narrow form of the species, measuring 22<sup>cm</sup> in length by about 14<sup>cm</sup> in width across the back of the head, and 12<sup>cm</sup> across the widest portion of the thorax. The palpebral lobes and movable cheeks are broken away, also the posterior segment of the thorax and the pygidium is displaced. Mr. Green describes the species as having 17 thoracic segments; but in a very fine specimen now in the collection of the Boston Society of Natural History, 18 segments are shown between the head and pygidium; and Mr. Henry D. Rogers gives a very perfect figure with 18 thoracic segments.

Mr. Ordway, in making a comparison between that species and the Bohemian *P. spinosus* (Proc. Boston Soc. Nat. Hist., vol. viii, p. 3), gives an outline figure of the head of *P. Harlani*, which is evidently a restored figure made up from fragments.

At the request of Mr. J. D. Dana, Mr. F. B. Meek drew a figure of *P. Harlani* for the Manual of Geology, from more or less fragmentary specimens in Mr. Dana's collection. This is one of the best, but not the best (see Rogers's figure), representations of the species yet published; but in the presence of 19 segments in the thorax, and the short extension of the posterior pleuræ and other details, it varies from specimens before us. There is considerable variation in the species in the relative length and breadth of individuals. In a form similar to the type, the length is 21<sup>cm</sup>, and the greatest breadth of the thorax 10<sup>cm</sup>. In two broad specimens the length is 25<sup>cm</sup> and 35<sup>cm</sup>; the breadth of the thorax 16<sup>cm</sup> and 20<sup>cm</sup>, respectively. This variation is also shown in the pygidium, as may be seen by comparing figs. 16, *c*, *d* of plate viii. In the head the greatest variation is seen in the contour of the frontal margin and the gradual development of the frontal limb and rim. On the small specimens the frontal limb is very short and more or less rounded. With the increase in size, the space between the glabella and the marginal rim increases in width, and the latter broadens and flattens out. Our information respecting the postero-lateral spines of the head is limited. On the narrow form, fig. 1, plate ix, they extend back to a point opposite the

fourteenth thoracic segment; and the movable cheek, fig. 3, plate vii, shows a long, well-developed spine. There is a limited range of variation in the extension of the pleuræ of the thoracic segments, but the material for study is too limited to say what value may be placed upon it. In reviewing all the variations, I do not think that more than one species is indicated. A narrow and broad variety might be designated if thought desirable.

Of American species of the genus *Paradoxides*, *P. Bennetti*, Salter (Quart. Journ. Geol. Soc., vol. xv, p. 552, fig. 1, 1859), from Newfoundland, is the most nearly related. The figure accompanying Mr. Salter's description appears to have been taken from a distorted specimen, as the two specimens now before me, although imperfect, show a form very similar to that of *P. Harlani*.

Mr. Ordway has described the differences between *P. Harlani*, Green, and *P. spinosus*, Boeck (Proc. Boston Soc. Nat. Hist., vol. viii, pp. 1-5, 1861), and from my own observations and comparisons I cannot but agree with Mr. Ordway that the two species are represented. Mr. Barrande considered *P. spinosus* and *P. Harlani* as one species (Bull. Geol. Soc. France, vol. xvii, pp. 545-547, 1860). Mr. Barrande had the cast of the imperfect specimen described by Mr. Green to compare with specimens of *P. spinosus*, and photographs of three specimens sent to him by Mr. W. B. Rogers. The two species are, however, very closely related.

*Formation and locality.*—Lower Cambrian. Braintree argillites. Hayward's quarry, South Braintree, Mass.

### Genus PTYCHOPARIA, Corda.

#### PTYCHOPARIA ROGERSI, n. sp.

Plate vii, fig. 2.

This species is known only by the central portions of the head, and two specimens showing portions of the thorax.

Glabella cylindro-conical, rounding rather abruptly in front, posterior pair of glabellar furrows very faintly shown in one specimen; dorsal furrow strongly defined; occipital furrow rounded, well marked and extending out across the fixed cheeks; occipital ring rather narrow, rising at the center and extending backwards in a short, strong spine; fixed cheeks of medium width, moderately convex, and sloping forward to unite with the frontal limb; ocular ridges shown only on one specimen; starting a little back of the anterior end of the glabella, they extend obliquely backward to the small palpebral lobe; frontal limb rather narrow; it curves downward for a short distance in front of the glabella and then up to the frontal rim. The facial sutures cut the anterior margin so as to leave a narrow frontal limb, and then extend obliquely outward and backward to the palpebral lobe; back of this they extend obliquely outward to the posterior margin of the head.

Thorax formed of well marked, strongly trilobed, narrow segments; the axial lobe about one-third of the entire width anteriorly, and tapering rather rapidly backward; pleural grooves very narrow. Number of segments in the thorax unknown.

The condition of the preservation of the surface renders its character uncertain. It is apparently roughened or granulose.

Owing to the lateral compression of the specimen illustrated, the form of the glabella is too elongate. In hopes of getting better specimens the further illustration of the species is deferred.

The specific name is given in honor of Mr. W. B. Rogers, the distinguished geologist, who took so strong an interest in the discovery of the Braintree paradoxides beds in 1856.

*Formation and locality.*—Lower Cambrian. Braintree argillites. Hayward's quarry, South Braintree, Mass.

#### Genus AGRAULOS, Corda.

#### AGRAULOS QUADRANGULARIS, Whitfield.

Plate vii, fig. 1.

*Arionellus quadrangularis*, Whitfield, 1884. Bull. Amer. Nat. Hist., p. 147, plate xiv, fig. 8.

*Description.*—"Known only by the glabella and fixed cheeks, which are of small size, and as united are subquadrangular in form and depressed convex. Glabella quadrangular a little narrower in front than at the occipital line, squarely truncate in front and destitute of any appearance of glabellar furrows. Dorsal furrows bounding the glabella, deeply marked. Fixed cheeks about half as wide as the glabella, moderately convex in the middle. Frontal limb about as wide as the fixed cheeks, convex on the surface and strongly arched on the front border; no marginal rim exists. Palpebral lobes, one of which is visible, minute, and but slightly raised above the general surface of the fixed cheek adjacent. Occipital ring narrow. General surface smooth. This species is so entirely distinct in its quadrangular glabella that there is no possibility of confounding it with any other American species of the genus."

We have two specimens of this species showing the central portions of the head and fixed cheeks. The glabella is more elongate and less quadrangular than in the type specimen which appears to be longitudinally compressed, and also without the occipital ring and the posterolateral portions of the fixed cheeks. Restoring these parts in outline on the figure given by Mr. Whitfield, leads to the conclusion that we have but one species represented by specimens, varying considerably owing to their condition of preservation. The largest head is from the collection of Mr. N. S. Shaler, and measures 18<sup>mm</sup> in length. A smaller head in the collection of the Boston Society of Natural History is 9<sup>mm</sup> in length, and shows a small spine on the center of the occipital ring.

The first notice of this species is by Mr. Albert Ordway (Proc. Boston Soc. Nat. Hist., vol. viii, p. 6, 1861), where he refers it to the genus *Ellipsocephalus*, but does not propose a specific name. Mr. J. Marcou had a specimen in his collection for many years, but it does not appear to have been noticed until studied by Mr. Whitfield.

*Formation and locality.*—Lower Cambrian. Braintree argillites, associated with *Paradoxides Harlani* at Hayward's quarry, South Braintree, Mass.

(329)

Bull. 10—4



ON A NEW GENUS AND SPECIES OF PHYLLOPODA FROM  
THE MIDDLE CAMBRIAN.

Genus PROTOCARIS, n. gen.

Carapace without evidence of a dorsal suture, rounded on the dorsal line, and bent downward on the sides; without any rostrum. Body many-jointed—31 segments extending out from beneath the carapace; the last segment broader than the preceding, and terminating in two spines. Type *Protocaris Marshi*.

In comparing *Protocaris* (*P. Marshi*) with *Hymenocaris* (*H. vermicauda*) (Salter, 1852. Rep. Brit. Assoc., pt. 2, Notices and Abstracts, p. 58; Mem. Geol. Surv. Gt. Brit., vol. iii, p. 293, plate ii, figs. 1-4; plate v., fig. 25, 1866) we find that in the simple, bent or folded eyeless shield or carapace they are closely related, but in the structure of the body they differ materially. *Hymenocaris* has, in one instance, 9 strong segments shown in its more elongate body, the terminal one ending in three pairs of spines; usually 6 or 7 segments are seen, 8 or 9 are less frequent (Brit. Assoc. Rep. 1883, p. 219). *Protocaris* has 30 narrow segments, a large terminal segment or telson with two rather strong caudal or terminal spines.

PROTOCARIS MARSHI, n. sp.

Plate x, fig. 1.

The specimen on which the genus and species is founded is compressed between the laminae of the slate so that the entire outline of the carapace is shown and the body is widened out. As flattened the carapace is rounded, quadrangular in outline, with a more or less distinctly defined marginal rim all around. The general surface appears to have been smooth. No evidence of eyes.

The body projecting beyond the carapace is about two-thirds as long as the carapace, narrows posteriorly, and is made up of numerous narrow segments, each about one-third of a millimeter in breadth; the last segment or telson, which is 2.5<sup>mm</sup> long, supports two caudal spines 7 or 8<sup>mm</sup> in length; 30 segments appear between the posterior edge of the carapace and the telson; the segments appear to have been smooth and without a spinose or crenulated posterior margin; the telson and caudal spines also appear to have been smooth and without ornamentation.

*Dimensions.*—Total length, 42<sup>mm</sup>; length of carapace, 21<sup>mm</sup>; width, 26<sup>mm</sup>; length of body, 15<sup>mm</sup>, exclusive of caudal spines; width of body, where it passes beneath the carapace, 10<sup>mm</sup>; at telson, 4<sup>mm</sup>.

The specific name is given in honor of Prof. O. O. Marsh.

*Formation and locality.*—Middle Cambrian. Georgian formation. Parker's farm, town of Georgia, Vt.



# INDEX.

[Figures in heavy-faced type indicate the page on which the description is given.]

|                                         | Page.          |                                   | Page.                  |
|-----------------------------------------|----------------|-----------------------------------|------------------------|
| Acadian Group, Note on.....             | 9              | Conocephalites quadrata .....     | 39                     |
| Acrothele .....                         | 15             | Robbi .....                       | 36                     |
| Matthewi .....                          | 11, 15, 16     | tener .....                       | 41                     |
| Agassiz, Alexander .....                | 43             | Therapites .....                  | 40                     |
| Agnostus .....                          | 23             | Aurora = Ptychoparia Ou-          |                        |
| Acadiens .....                          | 11, 12, 13, 29 | angondiana, var. Aurora .....     | 11                     |
| brevifrons .....                        | 12, 23         | formosus = Ptychoparia            |                        |
| Cambrensis .....                        | 12             | Robbi .....                       | 11                     |
| integer .....                           | 13, 23         | gemini-spinosus = Conoco-         |                        |
| interstrictus .....                     | 23             | coryphe Matthewi .....            | 11                     |
| Neon .....                              | 23             | Halli = Ptychoparia Ores-         |                        |
| similis .....                           | 22, 23         | tes .....                         | 11                     |
| Agraulos .....                          | 49             | neglectus = Ptychoparia           |                        |
| affinis .....                           | 13, 14         | tener .....                       | 11                     |
| oeticephalus .....                      | 14             | Therapites = Ptychoparia          |                        |
| longiocephalus .....                    | 14             | Orestes, var. Therapites ..       | 11                     |
| quadrangularis .....                    | 14, 44, 45     | Conocephalus striatus .....       | 35                     |
| socialis .....                          | 13, 14, 44     | Sulseri .....                     | 35                     |
| strenuus .....                          | 13, 14         | Conocoryphe .....                 | 23                     |
| Anopolenus .....                        | 13             | bufo .....                        | 12, 34                 |
| Arionellus quadrangularis .....         | 43             | coronatus .....                   | 13, 29, 30, 35         |
| = Agraulos quadrangularis ..            | 43             | Dalmani .....                     | 12, 34                 |
| Barrande, Mr. ....                      | 44             | elegans .....                     | 11, 12, 13, 33, 34     |
| Bathyrus gregarius .....                | 36             | emarginata .....                  | 34                     |
| = Solenopleura gregarius .....          | 13             | exulans .....                     | 12, 29, 35             |
| Billings, E. ....                       | 13, 25         | Haguel .....                      | 35                     |
| Bohemian Basin .....                    | 44             | Matthewi .....                    | 11, 12, 13, 23, 30, 35 |
| Paradoxides fauna .....                 | 13             | Solvensis .....                   | 12, 29, 35             |
| Boston Society of Natural History ..    | 43             | Sulseri .....                     | 12, 35                 |
| Braintree argillites .....              | 14, 43         | tenuicincta .....                 | 34                     |
| Cambrian faunas of North America ..     | 9              | Walcotti .....                    | 11, 30                 |
| Cambrian, Middle, new genus and species |                | (Elyx.) laticeps .....            | 30                     |
| of Phyllopoda from .....                | 49             | (Salteria) Baileyi .....          | 11, 12, 13, 33, 33     |
| system, Note .....                      | 11             | (Salteria) venulosa .....         | 12, 33                 |
| Carboniferous system .....              | 9              | (Subgenus f) Matthewi .....       | 33                     |
| Cold Brook = Portland .....             | 30             | Crepicephalus lowensis .....      | 35                     |
| Conception Bay, Species from .....      | 13             | = Ptychoparia Haguel .....        | 35                     |
| Conocephalites .....                    | 12             | Ctenocephalus .....               | 35                     |
| Aurora .....                            | 38             | Dawson, J. W., Note .....         | 9                      |
| Baileyi .....                           | 29, 32         | Discina Acadica .....             | 19                     |
| elegans .....                           | 33             | Elliptocephalus .....             | 12                     |
| formosus .....                          | 36             | Eocystites .....                  | 14                     |
| gemini-spinosus .....                   | 23, 30         | primævus .....                    | 11, 14                 |
| Halli .....                             | 39, 40, 41     | Eodiscus pulchellus .....         | 24                     |
| Matthewi .....                          | 23, 30         | Eophyton .....                    | 12                     |
| neglectus .....                         | 41, 42         | Erinys venulosa .....             | 31                     |
| Orestes .....                           | 39             | Fauna, Bohemian Paradoxides ..... | 12, 13                 |
| Ouagondianum .....                      | 40             | Braintree argillites .....        | 43                     |
| Ouagondianus .....                      | 37, 38         | Cambrian of North America .....   | 9                      |

|                                           | Page.              |                                               | Page.               |
|-------------------------------------------|--------------------|-----------------------------------------------|---------------------|
| Fauna, Manuel's Brook .....               | 18                 | Paradoxides Acadicus .....                    | 10, 11, 12          |
| Menevian, of Wales .....                  | 12                 | Bennetti .....                                | 13, 14, 43, 44      |
| North America, Cambrian .....             | 9                  | decorus .....                                 |                     |
| Swedish Paradoxides .....                 | 12                 | Eteminicus .....                              | 10, 11, 12          |
| Saint John .....                          | 9, 12, 13          | Eteminicus, var. brevisatus .....             | 10, 11,             |
| Green, Jacob .....                        | 43                 | Eteminicus, var. Malicetus .....              | 10, 11,             |
| Group, Menevian, of Wales .....           | 11                 | Eteminicus, var. pontificalis .....           | 10, 11,             |
| Saint John .....                          | 9                  | Eteminicus, var. Quacoensis .....             | 10,                 |
| subgeneric, indication of .....           | 12                 | Eteminicus, var. suricoideus .....            | 10, 11,             |
| Hartt, C. F. ....                         | 10, 18             | fauna .....                                   |                     |
| collection .....                          | 9                  | fauna, Bohemian .....                         |                     |
| Harttia .....                             | 18                 | fauna, Menevian .....                         |                     |
| Matthewi .....                            | 11, 19             | fauna, Swedish .....                          |                     |
| Huronian rock .....                       | 9                  | Harlani .....                                 | 14, 43, 44, 45, 46, |
| Hyatt, Alpheus .....                      | 43                 | Hicksi .....                                  |                     |
| Hymenocaris .....                         | 50                 | lamellatus .....                              | 10, 11, 12          |
| vermicauda .....                          | 50                 | lamellatus, var. Loricatus .....              | 10,                 |
| Hyalithes .....                           | 12, 20, 44         | Micmac .....                                  |                     |
| Acadica .....                             | 11, 20             | rugulosus .....                               | 13,                 |
| acilis .....                              | 20                 | slates of Saint Mary's Bay,                   |                     |
| Americanus .....                          | 20                 | Newfoundland .....                            |                     |
| cinctus .....                             | 11, 13, 21         | sp .....                                      |                     |
| Danianus .....                            | 11, 13, 20, 21     | spinosus .....                                | 43, 44, 45, 46,     |
| excellens .....                           | 13, 14, 44         | tenellus .....                                |                     |
| Micmac .....                              | 11, 21             | (Anopolenus) venustus .....                   |                     |
| primordialis .....                        | 11, 20             | Phyllopoda, new genus and species of .....    | 4                   |
| Shaleri .....                             | 14, 44             | Protocaris, n. gen. ....                      | 4                   |
| Lingula .....                             | 15                 | Marshi, n. sp. ....                           | 4                   |
| ! Dawsoni .....                           | 11, 15             | Protocystites Menevensis .....                | 11,                 |
| ferruginea .....                          | 15                 | Ptychoparia .....                             | 12, 34,             |
| Matthewi .....                            | 15                 | applanata .....                               |                     |
| Liostracus .....                          | 36                 | cristata .....                                |                     |
| Manuel's Brook, fauna of .....            | 13                 | Emmrichi .....                                | 13, 14, 35,         |
| Matthew, G. F. ....                       | 9, 19              | formosus .....                                |                     |
| Menevian group of Wales .....             | 11, 12, 13         | Haguei .....                                  | 35,                 |
| Microdiscus .....                         | 23                 | Linnaesoni .....                              |                     |
| Dawsoni .....                             | 11, 13, 23, 24     | Orestes .....                                 | 11, 13, 39, 40,     |
| pulchellus .....                          | 21, 24, 25         | Orestes, var. Thersites .....                 | 11, 4               |
| punctatus .....                           | 11, 12, 13, 24, 25 | Ouangondiana .....                            | 11, 37, 39,         |
| speciosus .....                           | 25                 | Ouangondiana, var. Aurora .....               | 11, 4               |
| Middle Cambrian, new genus and species    |                    | Ouangondiana, var. Aurora .....               |                     |
| of Phyllopoda from .....                  | 50                 | quadrata .....                                | 11, 4               |
| Murray, Alexander .....                   | 13                 | Robbi .....                                   | 11, 12, 13, 36, 37, |
| Museum of Comparative Zoology .....       | 43                 | Rogersi .....                                 | 14, 44, 4           |
| New genus and species of Phyllopoda ..... | 50                 | striata .....                                 | 35,                 |
| North America, Cambrian faunas of .....   | 9                  | tener .....                                   | 11, 13, 41,         |
| Obolella .....                            | 16                 | = Conocephalus .....                          | 4                   |
| ! miser .....                             | 13                 | (= Conocoryphe) applanata .....               |                     |
| sagittalis .....                          | 12, 16             | (Crepicephalus) Iowensis .....                |                     |
| transversa .....                          | 11, 12, 16         | (Solenopleura) communis .....                 | 13,                 |
| sp .....                                  | 11                 | (= Solenopleura) cristata .....               | 37,                 |
| sp. undt .....                            | 16                 | Rogers, William B. ....                       |                     |
| Obolus (Discina) nitida .....             | 16                 | Saint David's section of Wales .....          |                     |
| Olenellus asaphoides .....                | 13                 | Saint John fauna .....                        | 12, 13,             |
| Orthia .....                              | 17                 | formation, Application of the                 |                     |
| Billingsi .....                           | 11, 17, 18         | name of .....                                 |                     |
| exporecta .....                           | 18                 | group, Note as to the use of the              |                     |
| Hicksi .....                              | 17                 | term of .....                                 |                     |
| sp .....                                  | 11, 18             | group, Plant remains of the                   |                     |
| Ordway, Mr. ....                          | 43                 | higher divisions of .....                     |                     |
| Palaeomea .....                           | 19                 | Saint Mary's Bay, Paradoxides slates of ..... |                     |
| ! Acadica .....                           | 11, 19             | Salterella .....                              |                     |
| Palaeophycus .....                        | 12                 | Salteria .....                                | 12, 13              |
| Paradoxides .....                         | 25, 45             | Baileyi .....                                 |                     |

# INDEX.

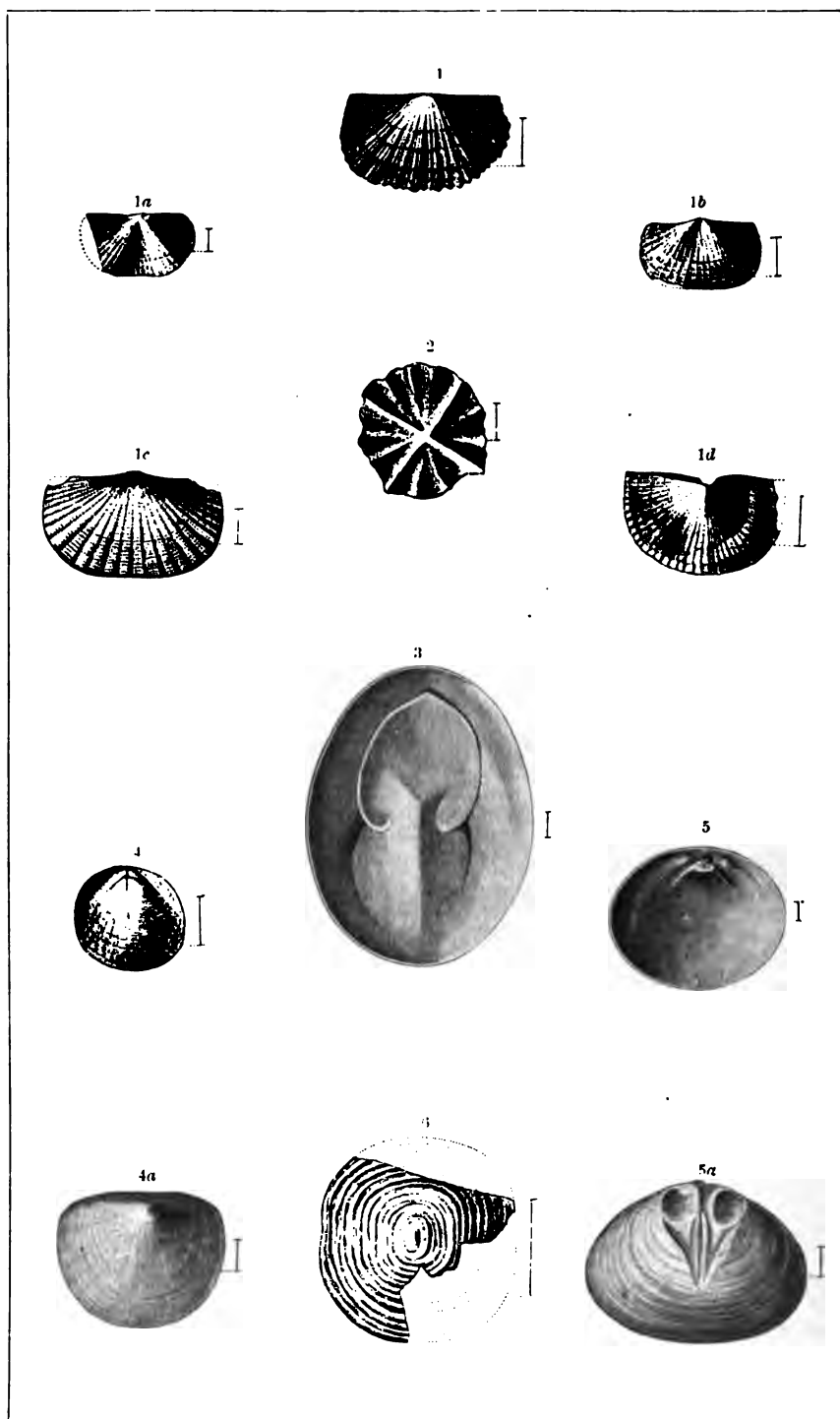
55

|                                    | Page.  |                               | Page.  |
|------------------------------------|--------|-------------------------------|--------|
| Salteria venulosa.....             | 12, 33 | System, Carboniferous .....   | 9      |
| Soenella reticulata .....          | 13     | Triassic .....                | 9      |
| Shaler, N. S.....                  | 43     | Theca Acadica .....           | 20     |
| Solenopleura .....                 | 36     | Triassic system .....         | 9      |
| Stenotheca .....                   | 19     | Wales, Menevian fauna of..... | 13     |
| pauper .....                       | 13     | Williams, H. S.....           | 10     |
| Straparolina remota .....          | 13     | Whiteaves, J. F.....          | 13     |
| Swedish Paradoxides fauna.....     | 12     | Whitfield, R. P.....          | 12, 43 |
| System, Cambrian, Note as to ..... | 11     |                               |        |

(335)

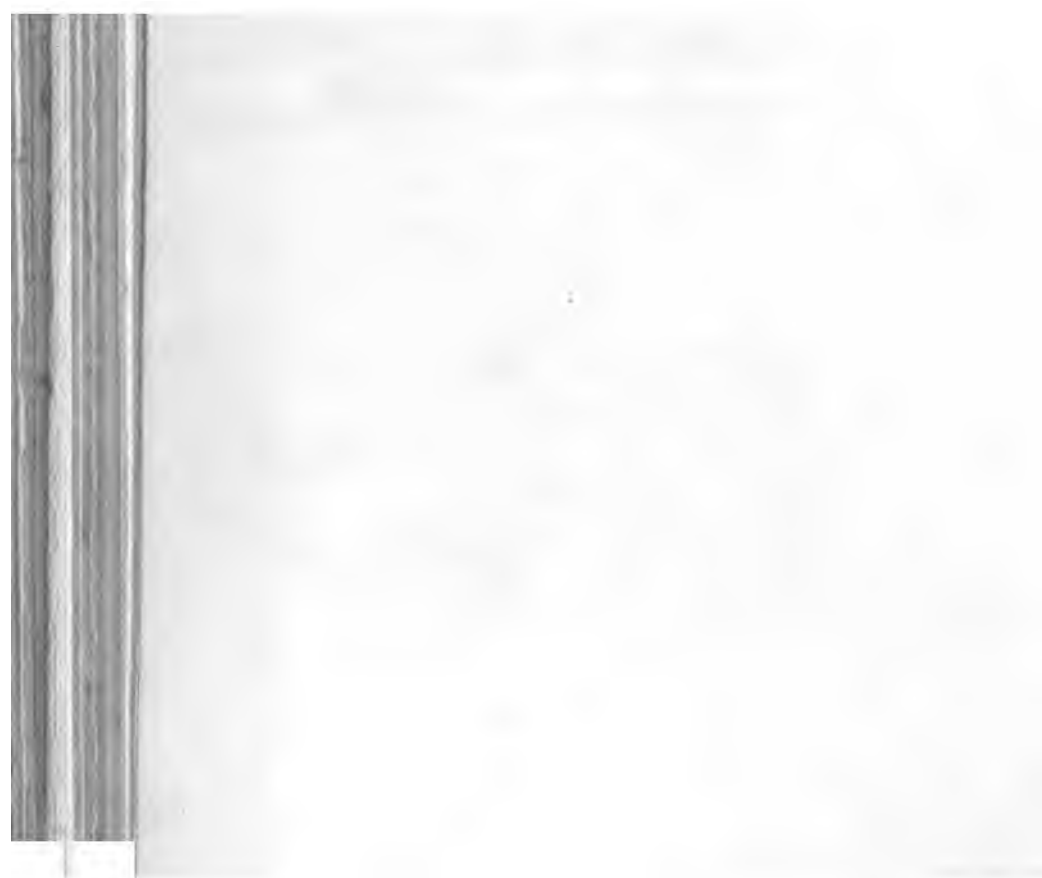
# PLATE I.

- Fig. 1. *ORTHIS BILLINGSI*.....  
 1. Cast of a ventral ? valve having fasciculate or bifurcate costæ, enlarged to two diameters.  
 1a. A small ventral valve doubtfully referred to this species, enlarged to three diameters.  
 1b. Cast of a ventral valve with sharp radiating costæ, enlarged to two diameters.  
 1c. Exterior surface of a dorsal ? valve marked by simple costæ crossed by fine concentric undulating striæ, enlarged to three diameters.  
 1d. Interior cast of ventral ? valve, enlarged to two diameters.
- Fig. 2. *EOCYSTITES PRIMÆVUS*.....  
 2. Enlargement to four diameters of a single plate.
- Fig. 3. *HARTIA MATTHEWI*.....  
 3. Interior of shell, enlarged to twelve diameters.
- Fig. 4. *ACROTHELE MATTHEWI*.....  
 4. Dorsal valve, enlarged to two diameters.  
 4a. Supposed ventral valve, enlarged to four diameters.
- Fig. 5. *OBOLELLA TRANSVERSA*.....  
 5. Interior of ventral valve, enlarged to eight diameters.  
 5a. Cast of the interior of the dorsal valve, enlarged to six diameters.
- Fig. 6. *PALÆACMEA ? ACADICA*.....  
 6. View of the type specimen of *Discina Acadica*, Hartt, enlarged to two diameters.



BRACHIOPODA AND GASTEROPODA.





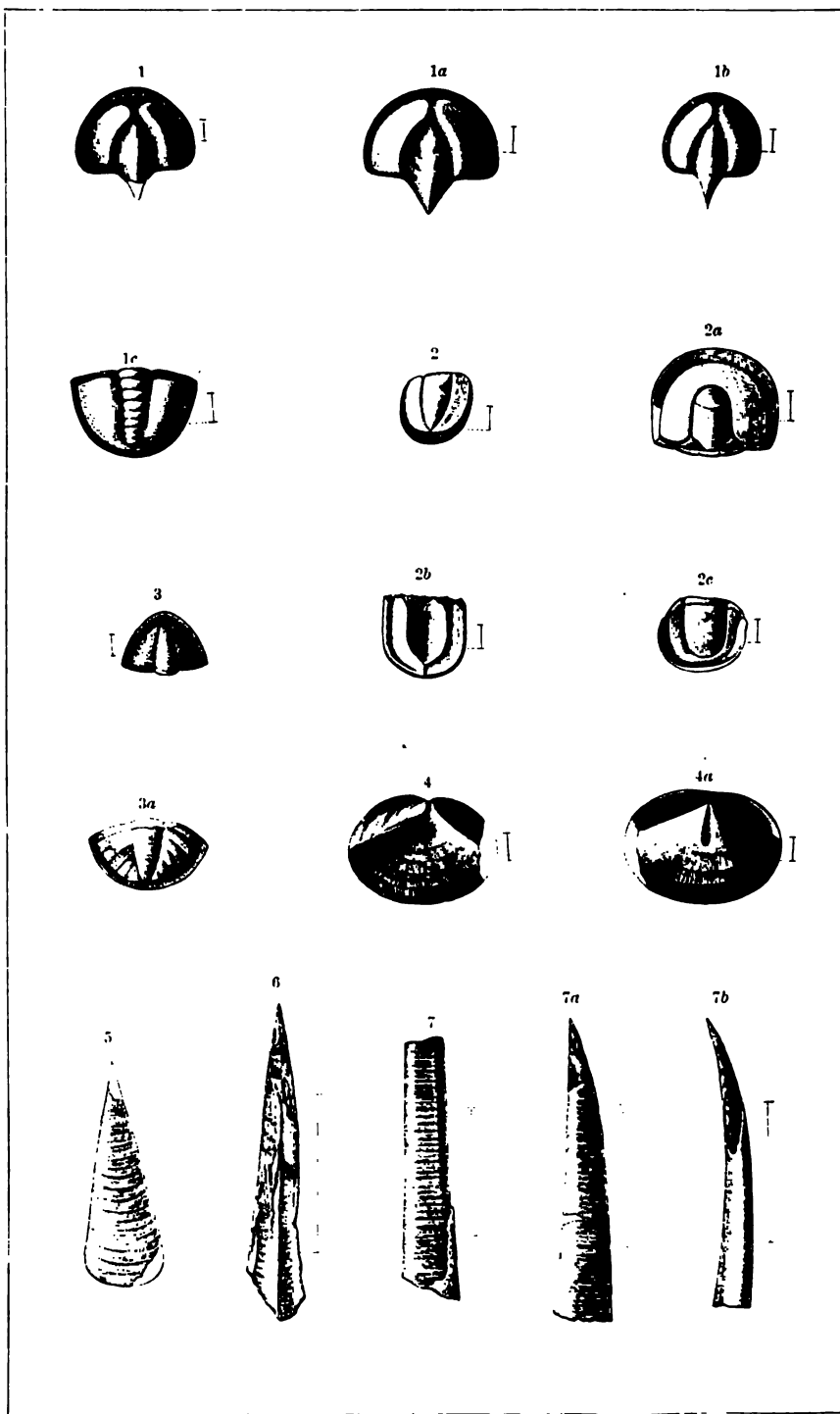


## PLATE II.

Pa

- Fig. 1. MICRODISCUS PUNCTATUS**.....  
     1, 1a, b. Head shields showing variations, enlarged to four diameters.  
     1c. Pygidium, enlarged to three diameters.
- Fig. 2. AGNOSTUS ACADICUS**.....  
     2a. Head shield, enlarged to three diameters.  
     2, 2b, c. Pygidia, enlarged to three diameters.
- Fig. 3. MICRODISCUS DAWSONI**.....  
     3. Head shield, enlarged to three diameters.  
     3a. Pygidium, enlarged to three diameters.
- Fig. 4. HYOLITHES**.....  
     4. Interior cast of operculum, enlarged to four diameters.  
     4a. Exterior of operculum, enlarged to four diameters.
- Fig. 5. HYOLITHES ACADICA**.....  
     5. Ventral face, natural size.
- Fig. 6. HYOLITHES MICMAC**.....  
     6. Enlargement to two diameters of the type specimen.
- Fig. 7. HYOLITHES DANIANUS**.....  
     7. Dorsal view of a portion of the shell, enlarged to two diameters.  
     7a. Ventral side, enlarged to two diameters.  
     7b. Side view to show the curvature of the shell, enlarged to two diameters.

(338)



PECILOPODA AND PTEROPODA.





### PLATE III.

Pa

Fig. 1. PARADOXIDES ETEMINICUS .....

- 1. Variety *suricoides* (after Matthew).
- 1a. A small pygidium (after Matthew).
- 1b. Medium sized head, flattened (after Matthew).
- 1c. Variety *breviatus* (after Matthew).
- 1d. Variety *pontificalis* (after Matthew).
- 1e. Head of a young individual in the Hartt collection shortened by compression, enlarged to four diameters.
- 1f. Head of a young individual showing wide frontal rim, enlarged to two diameters (after Matthew).
- 1g. Head showing narrower frontal rim than fig. 1f, enlarged to two diameters (after Matthew).

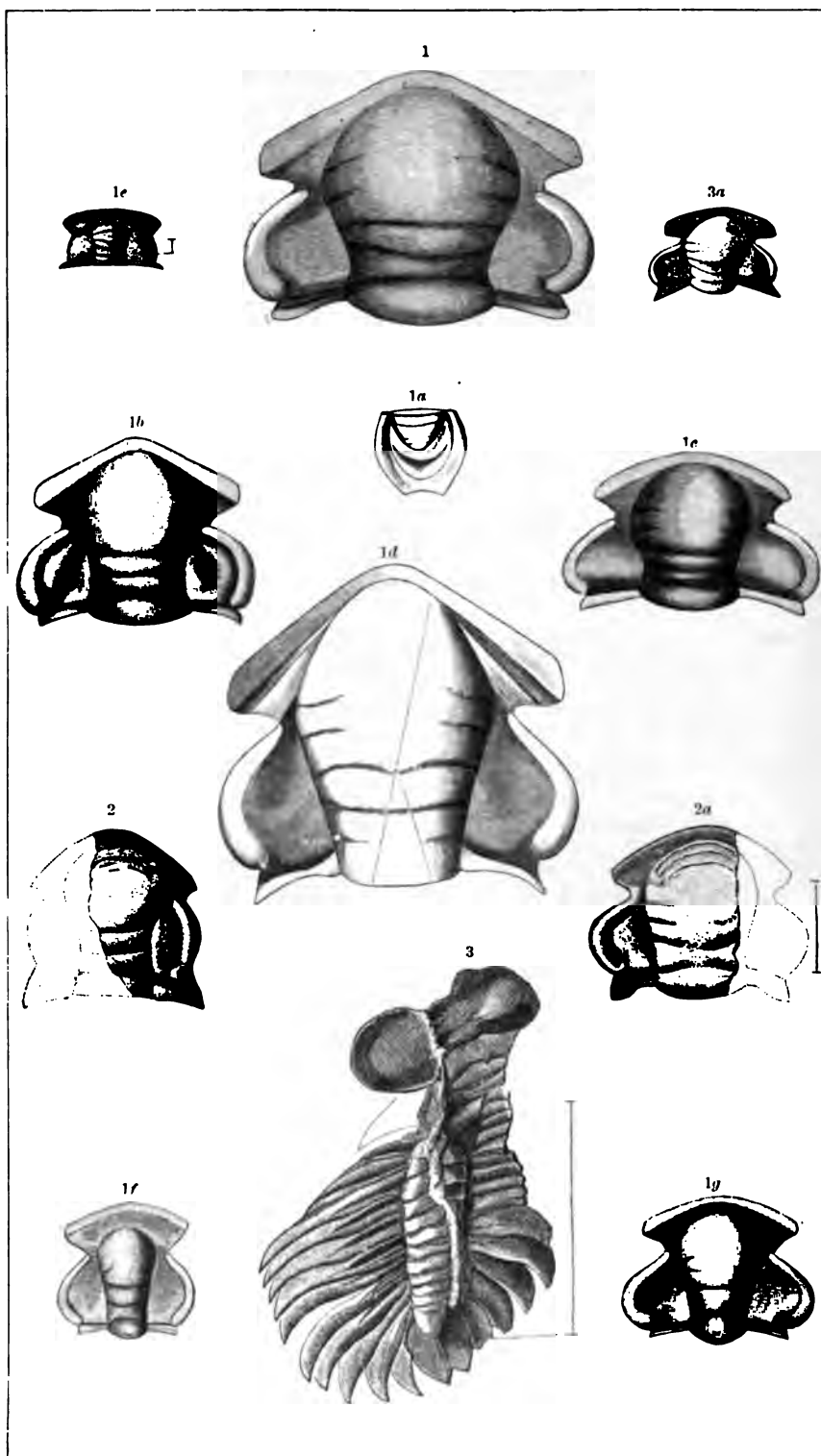
Fig. 2. PARADOXIDES LAMMELLATUS .....

- 2, 2a. The two type specimens of the species. 2a is enlarged to two diameters.

Fig. 3. PARADOXIDES ACADICUS .....

- 3. A distorted specimen showing the pygidium and portions of the thorax and head, enlarged to two diameters.
- 3a. Head; natural size.

(340)



PECTILOPODA.





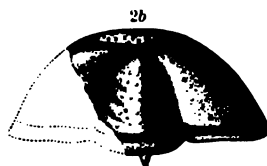
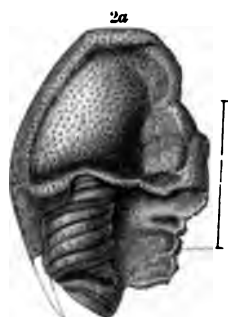
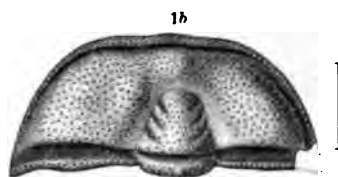
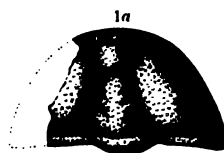
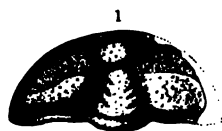


# PLATE IV.

Pa

- Fig. 1. CONOCORYPHE MATTHEWI.....  
 1. Head compressed longitudinally.  
 1a. Head compressed a little laterally, but nearly in its normal form.  
 1b. Finely granulose variety, enlarged to two diameters.
- Fig. 2. CONOCORYPHE ELEGANS.....  
 2, 2b. Heads, natural size.  
 2a. Side of head, with genal spine attached, enlarged to two diameters. This may belong to *C. Matthewi*.
- Fig. 3. CONOCORYPHE (SALTERIA) BAILEYI.....  
 3. Large head, enlarged to two diameters.  
 3a. Side of head, with genal spine attached.  
 See plate v, figs 7, 7a.

(342)



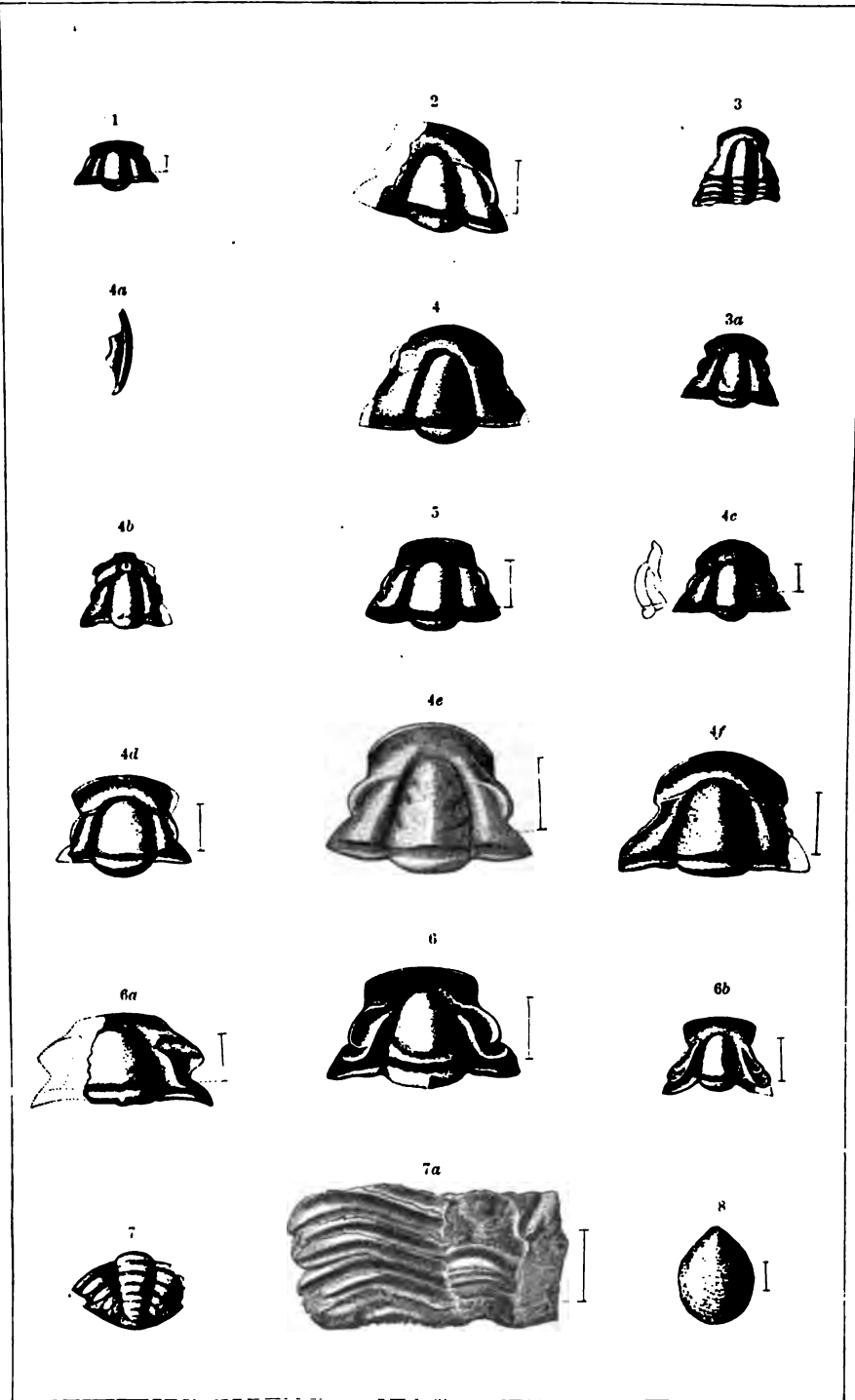
PECTILOPODA.





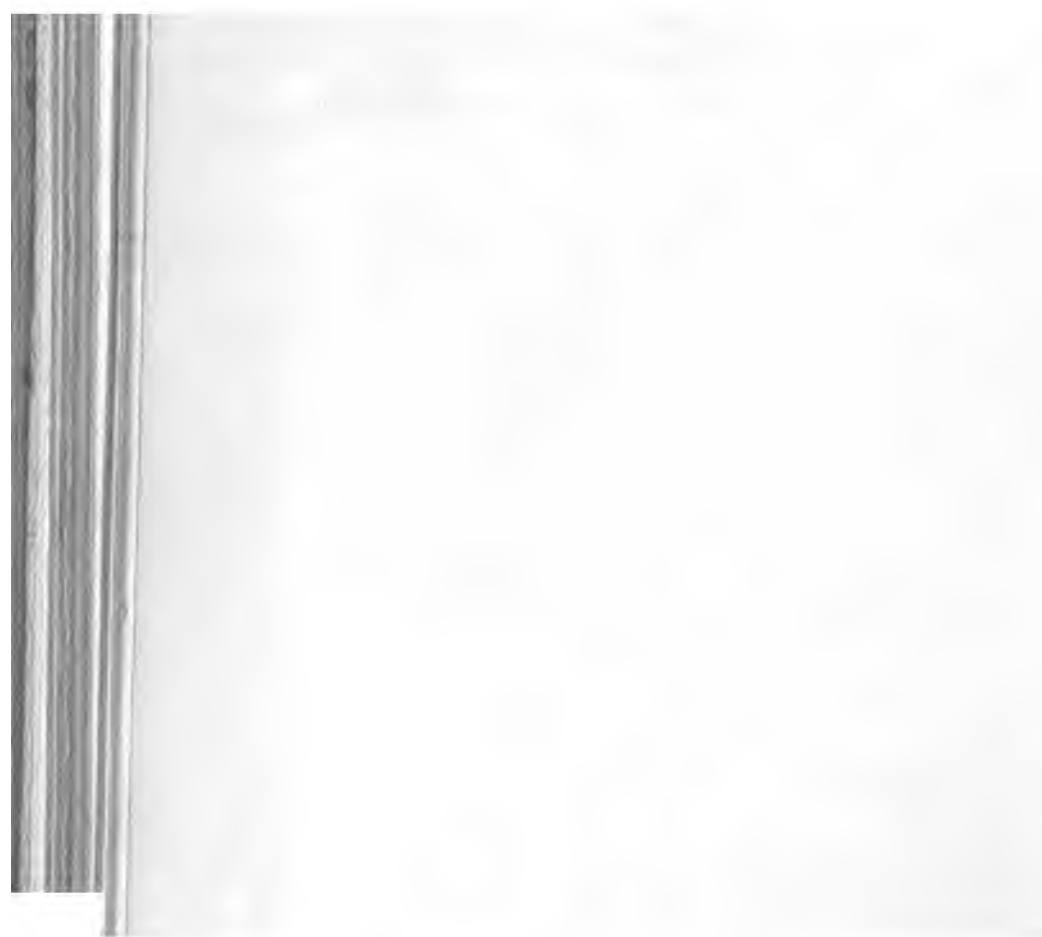
# PLATE V.

|                                                                                               |           |
|-----------------------------------------------------------------------------------------------|-----------|
| Fig. 1. PTYCHOPARIA QUADRATA .....                                                            | Page<br>3 |
| 1. Type specimen, enlarged to two diameters.                                                  |           |
| Fig. 2. PTYCHOPARIA ORESTES var. THERSITES .....                                              | 4         |
| 2. Type of <i>Conocephalites Thersites</i> , Hartt, enlarged to two diameters.                |           |
| Fig. 3. PTYCHOPARIA ORESTES .....                                                             | 3         |
| 3. Type of <i>Conocephalites Halli</i> , Hartt.                                               |           |
| 3a. Type of <i>C. Orestes</i> .                                                               |           |
| Fig. 4. PTYCHOPARIA OUANGONDIANA .....                                                        | 1         |
| 4. A specimen with the frontal furrow nearly obsolete, enlarged to three diameters.           |           |
| 4a. Free cheek associated with the head of this species.                                      |           |
| 4b. Distorted specimen referred to this species as a variety by Mr. Hartt.                    |           |
| 4c. A young head preserving its natural convexity and outline, enlarged to three diameters.   |           |
| 4d, 4f. Two examples showing variation in form, enlarged to two diameters.                    |           |
| 4e. Type of the species a little distorted by lateral compression, enlarged to two diameters. |           |
| Fig. 5. PTYCHOPARIA OUANGONDIANA var. AURORA .....                                            | 3         |
| 5. Type of <i>Conocephalites Aurora</i> , Hartt, enlarged to two diameters.                   |           |
| Fig. 6. PTYCHOPARIA TENER .....                                                               | 4         |
| 6, 6b. Types of the species, enlarged to two diameters.                                       |           |
| 6a. Type of <i>Conocephalites neglectus</i> , Hartt, enlarged to two diameters.               |           |
| Fig. 7. CONOCORYPHE (SALTERIA) BAILEYI .....                                                  | 3         |
| 7. Pygidium.                                                                                  |           |
| 7a. Portion of the thorax, enlarged to two diameters.                                         |           |
| See plate iv, figs. 3, 3a.                                                                    |           |
| Fig. 8. LINGULA † DAWSONI .....                                                               | 1         |
| 8. Ventral valve, enlarged to four diameters.                                                 |           |



PECULOPODA.

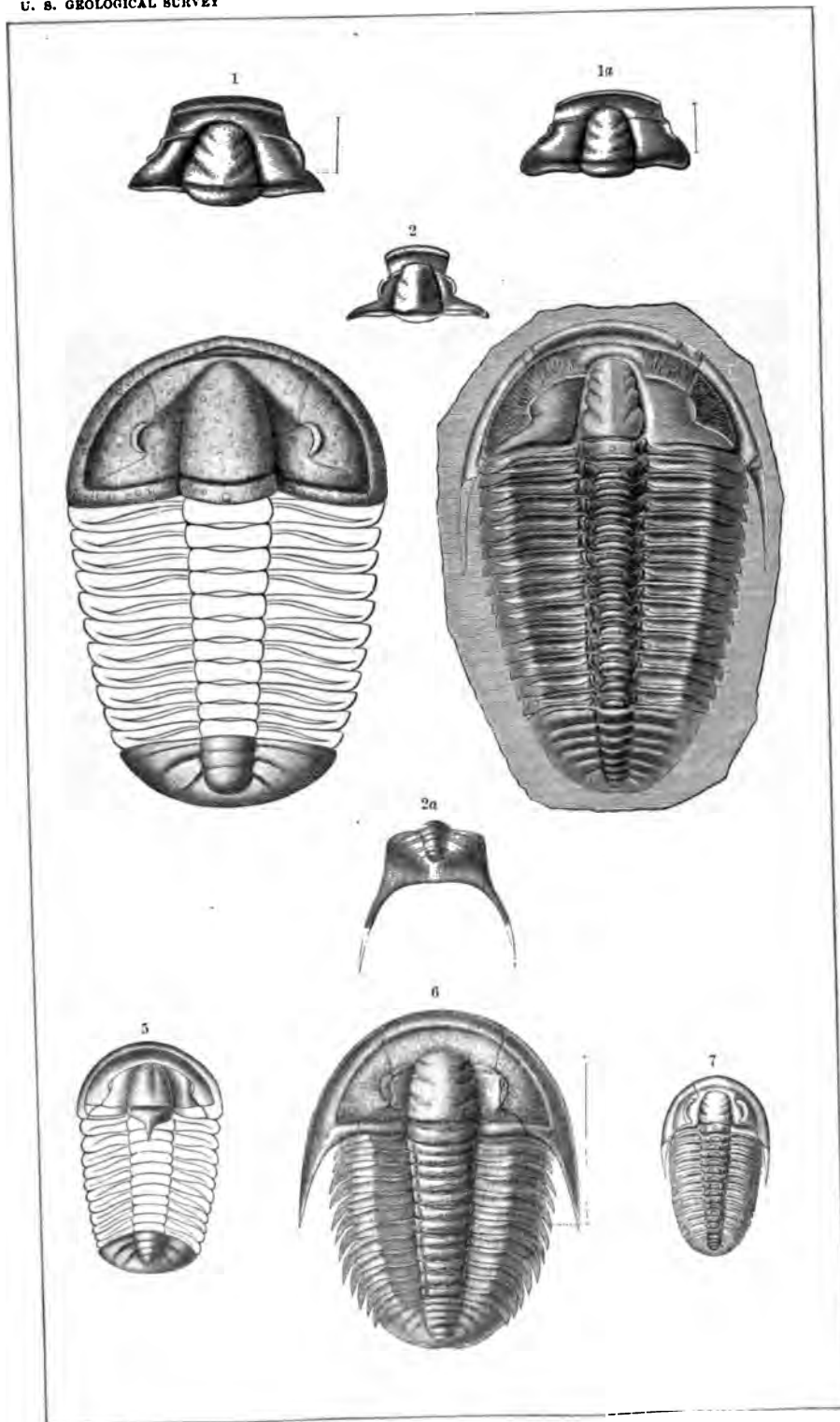






## PLATE VI.

|                                                                                      | Page |
|--------------------------------------------------------------------------------------|------|
| Fig. 1. PTYCHOPARIA ROBBI .....                                                      | 3    |
| 1. Type of the species, enlarged to two diameters.                                   |      |
| 1a. Type of <i>Conocephalites formosus</i> Hartt, enlarged to two diameters.         |      |
| Fig. 2. PTYCHOPARIA (CREPICEPHALUS) IOWENSIS .....                                   | 3    |
| 2. Head exclusive of the free cheeks.                                                |      |
| 2a. Pygidium.                                                                        |      |
| Fig. 3. SOLENOPLEURA HOLEMATOPA .....                                                | 3    |
| 3. Type of the genus (after Angelin).                                                |      |
| Fig. 4. PTYCHOPARIA STRIATUS .....                                                   |      |
| 4. Type of the genus. Figure taken from Barrande.                                    |      |
| Fig. 5. LIOSTRACUS ACULEATUS .....                                                   |      |
| 5. Type of the genus (after Angelin).                                                |      |
| Fig. 6. PTYCHOPARIA HAGUEI .....                                                     | 3    |
| 6. Typical form of the genus <i>Crephicephalus</i> of Hall and Whitfield.            |      |
| Fig. 7. PTYCHOPARIA EMMRICHI .....                                                   |      |
| 7. Second type of the genus <i>Ptychoparia</i> , Corda. Figure copied from Barrande. |      |

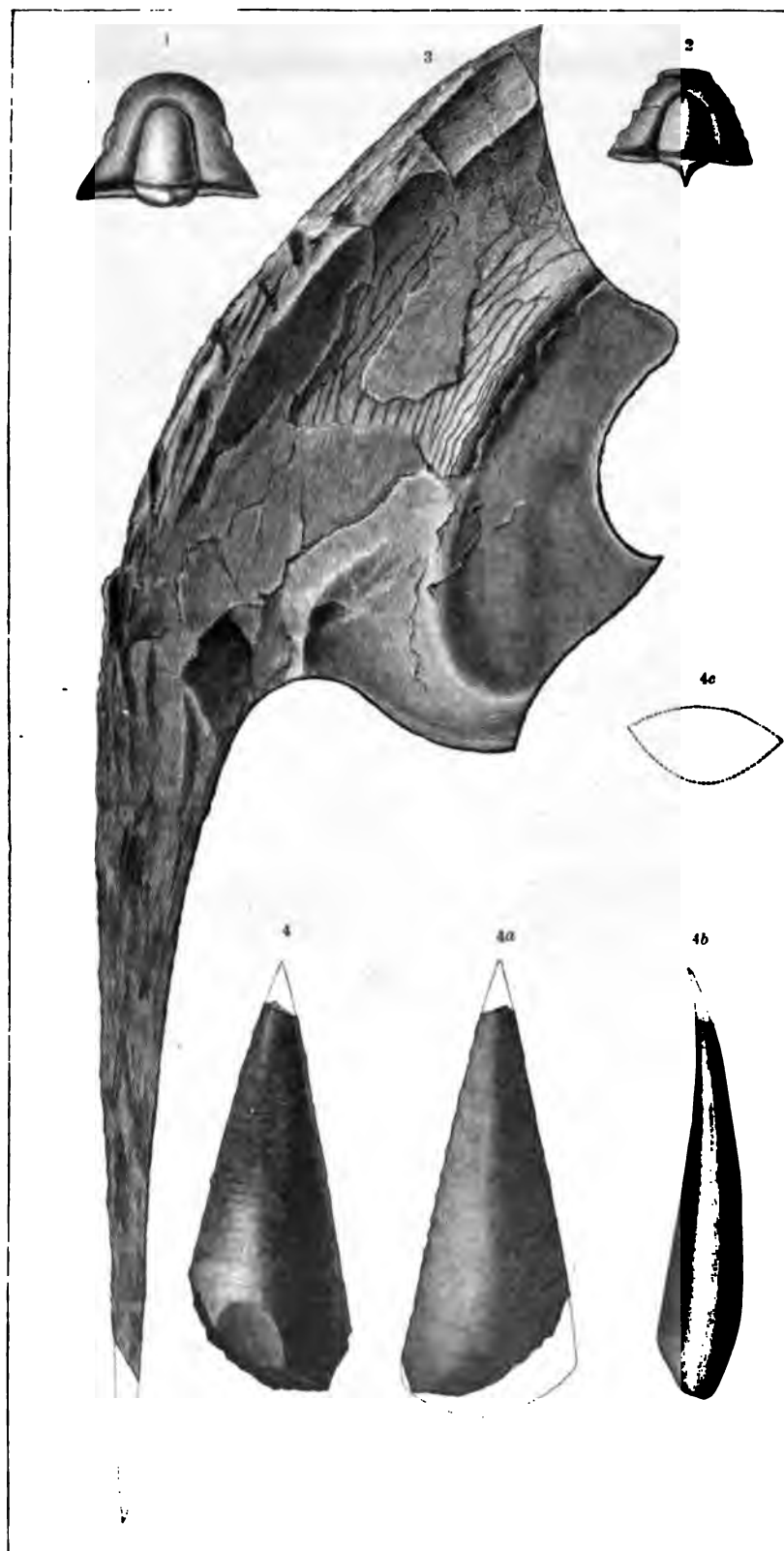


PECILOPODA.









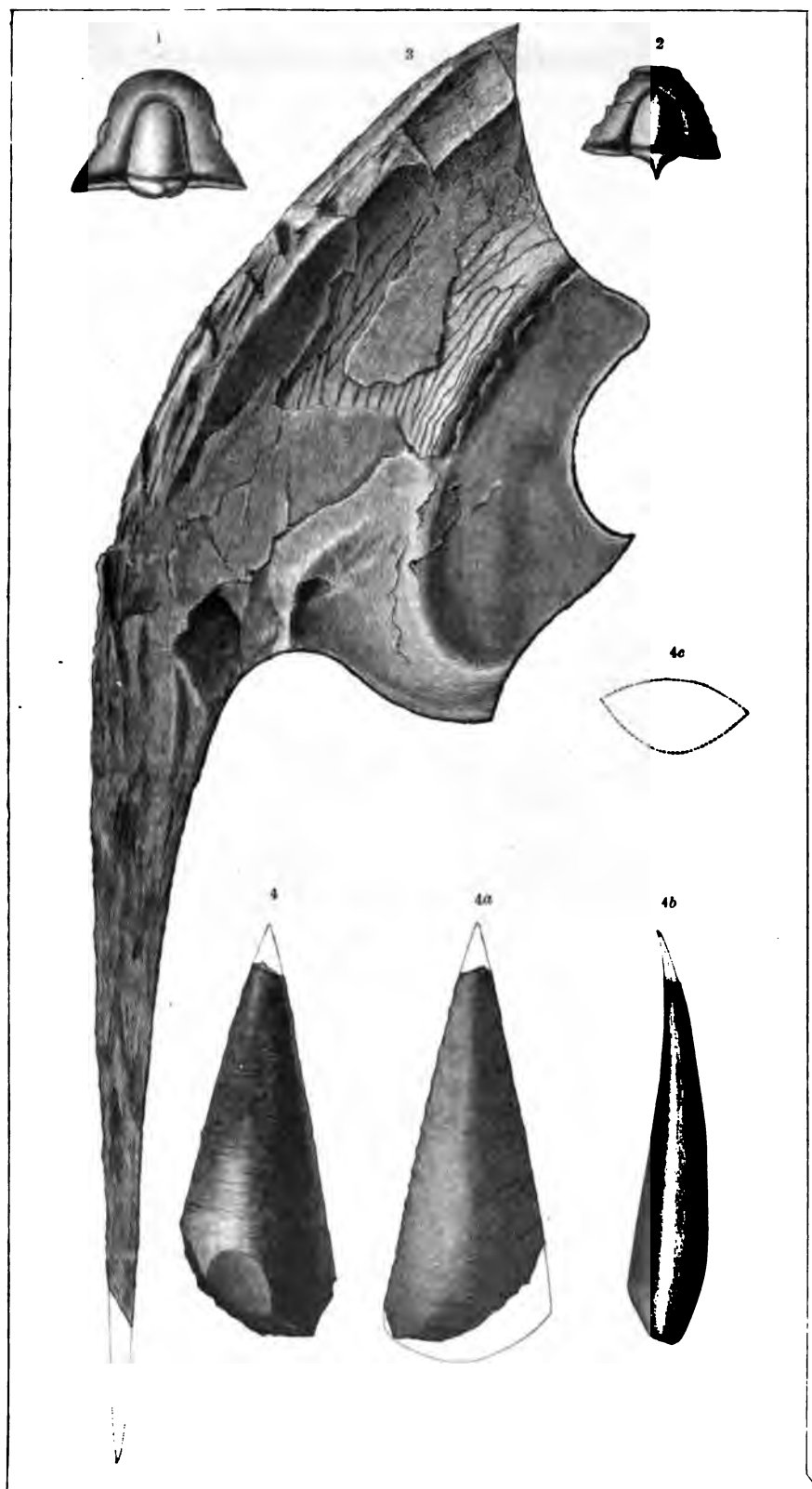
PTEROPODA AND PECCOLOPODA.



## PLATE VII.

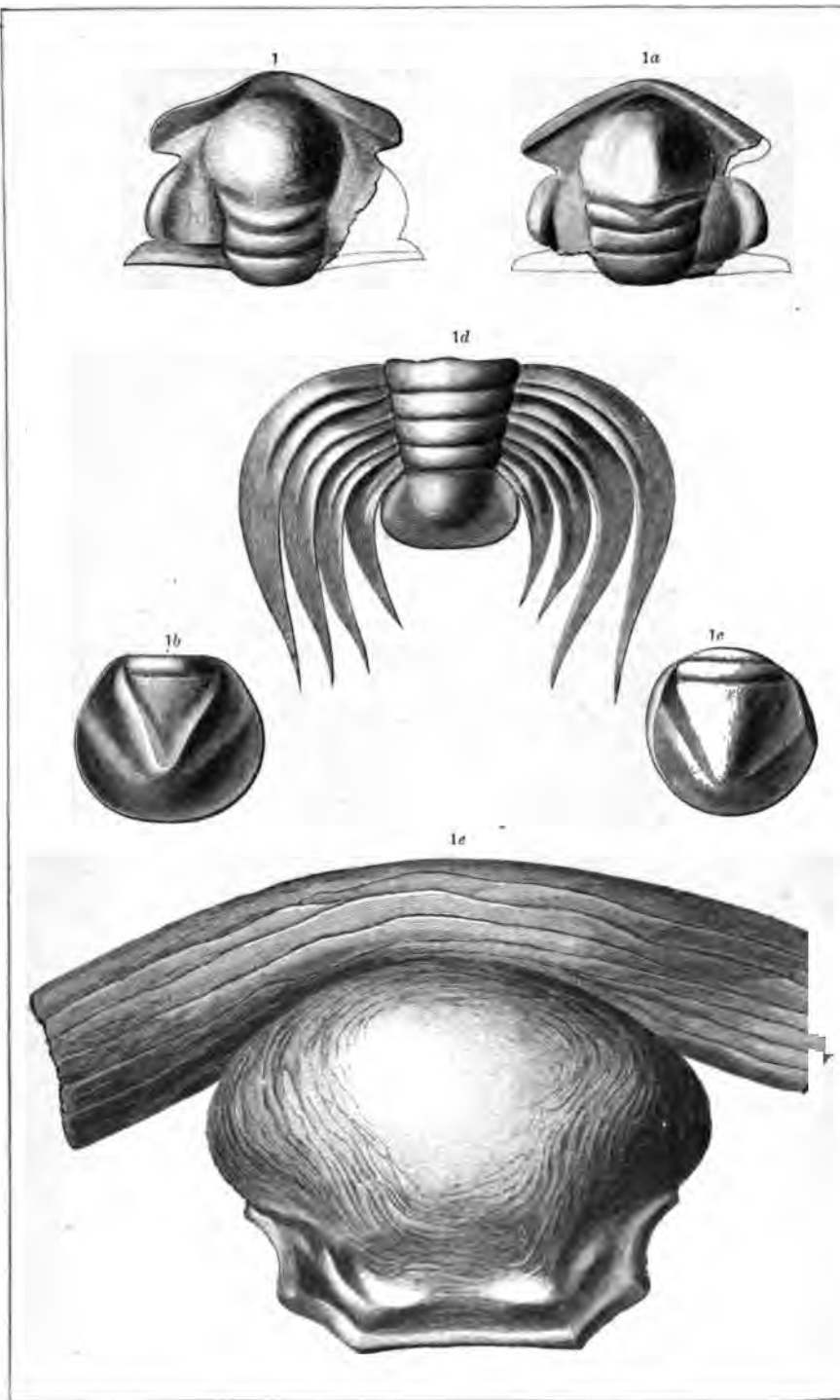
- Fig. 1. AGRAULOS QUADRANGULARIS**.....  
 1. Head exclusive of the free cheeks. Natural size. Collection of Prof. N. S. Shaler.
- Fig. 2. PTYCHOPARIA ROGERSI** .....  
 2. View of type specimen. Natural size. Collection of Prof. N. S. Shaler.
- Fig. 3. PARADOXIDES HARLANI**.....  
 3. Large free cheek flattened by compression. Collection of Boston Society Natural History.
- Fig. 4. HYOLITHES SHALERI**.....  
 4, 4a, 4b. Dorsal, ventral, and lateral, views. Natural size.  
 4c. Transverse section. Collection of Prof. N. S. Shaler.

(348)



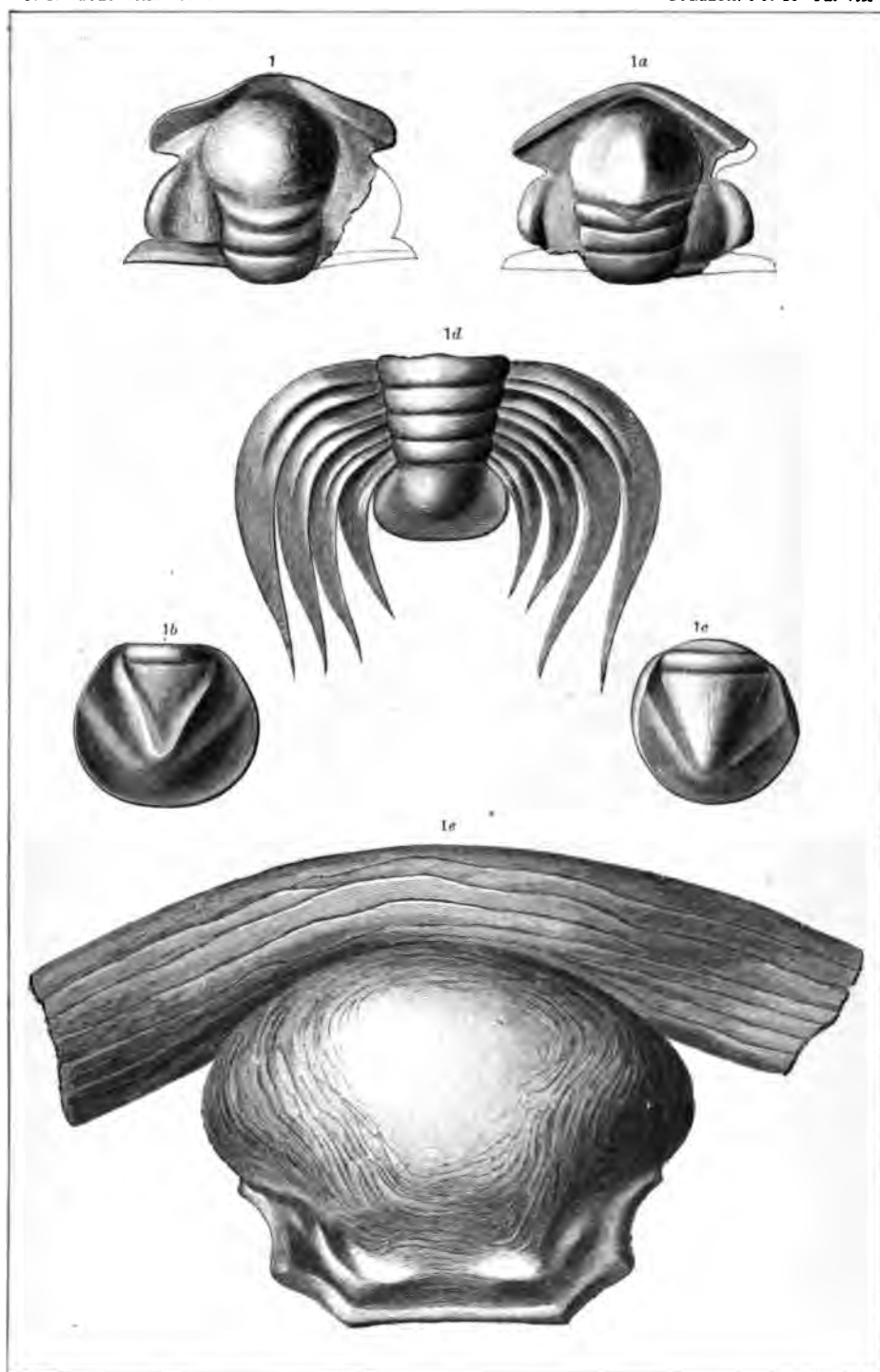
PTEROPODA AND PECCOLOPODA.





PECILOPODA.





PECILOPODA.

PLATE IX.

Fig. 1. PARADOXIDES HARLANI.....

1. A large individual preserving the body and parts of the head. The light colored portions are restored and the pygidium, which is pushed a little out of position, replaced. The specimen is from the collection of the Boston Society of Natural History.

(352)

U. S.









PLATE X.

- Fig. 1. *PROTOCARIS MARSHI* .....
1. View of the type specimen as it occurs flattened out on the shale. The body rings are more obscured in the anterior portion of the body than as represented in the figure. Enlarged to two diameters.

(354)



PHYLLOPODA.



DEPARTMENT OF THE INTERIOR

---

BULLETIN

OF THE

UNITED STATES

GEOLOGICAL SURVEY

No. 10

ON THE CAMBRIAN FAUNAS OF NORTH AMERICA

WASHINGTON  
GOVERNMENT PRINTING OFFICE  
1884



**DEPARTMENT OF THE INTERIOR**

---

**BULLETIN**

**OF THE**

**UNITED STATES**

**GEOLOGICAL SURVEY**

**No. 10**

**ON THE CAMBRIAN FAUNAS OF NORTH AMERICA**

**WASHINGTON**  
**GOVERNMENT PRINTING OFFICE**  
**1884**





**NOTICE.**

The bulletins of the United States Geological Survey will be numbered in  
ous series and will be bound in volumes of convenient size.  
This bulletin will be included in Volume II.

+

/





